CONGRESS AND THE DIESEL-ENGINED SHIP

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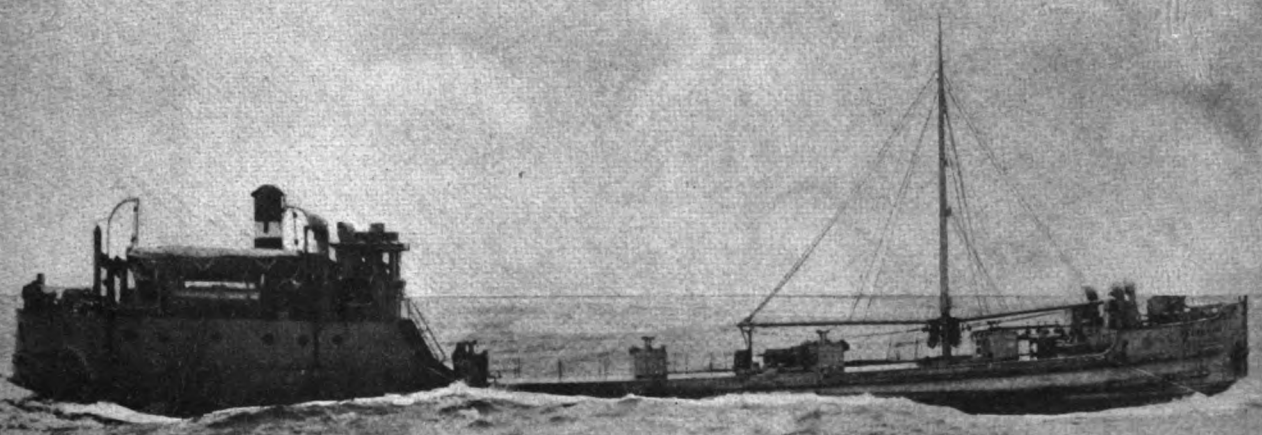
DIESEL MARINE ENGINES
FOR ALL CLASSES OF SHIPS



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MOTORSHIP

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Vol. VI — New York, U. S. A., January, 1921 — No. 1

First American-Werkspoor Diesel-Engined Ship

Excellent Results on Maiden Voyage of Standard Oil Co.'s Tanker, "Charlie Watson," propelled by Twin Skandia-built Werkspoor-Diesel Engines of 550 Shaft H.P. Each

By CHAS. W. GEIGER

EARLY last year the Standard Oil Company of Calif. placed an order with two Pacific Coast shipbuilders for two motor-tankers, one of 2,300 tons d.w.c. and 1,100 shaft h.p. to be built by the Union Construction Co. of Oakland, and the other of 5,010 tons d.w.c. and 1,700 shaft h.p. to be built by the Moore Shipbuilding Co. of Oakland, Cal. A complete description and drawings of these vessels appeared in our issue of April, 1920. Both are engined by the Skandia Pacific Oil Engine Co. of Oakland, and are of special interest in view of the fact that they are the first Werkspoor-type four-cycle Diesel engines ever built in the United States under license. The smaller of these tankers, namely the "Charlie Watson," was recently placed in service, having started on her maiden-voyage on the morning of Nov. 22 from San Francisco to Seattle, carrying a cargo of petroleum-products from the owners' plant at Point Richmond to their regional plant at Point Wells.

With reference to the trial trips which were previously run, due to the fact that the hull had laid at the dock for two months while being outfitted and did not go into dry-dock prior to the trials, her bottom was covered with growths which retarded her speed, and also because propellers of insufficient size were installed. Therefore this preliminary test cannot be regarded as official, but rather were given to test the reliability of the main motors. As the vessel got away from the dock in the trial it immediately became apparent that the propellers installed were too small, nevertheless the desired speed for the vessel was obtained and maintained throughout the trial, although only 430 b.h.p. was used. In obtaining the desired speed of the vessel at this horsepower 12% overspeed of the Diesel engines was required.

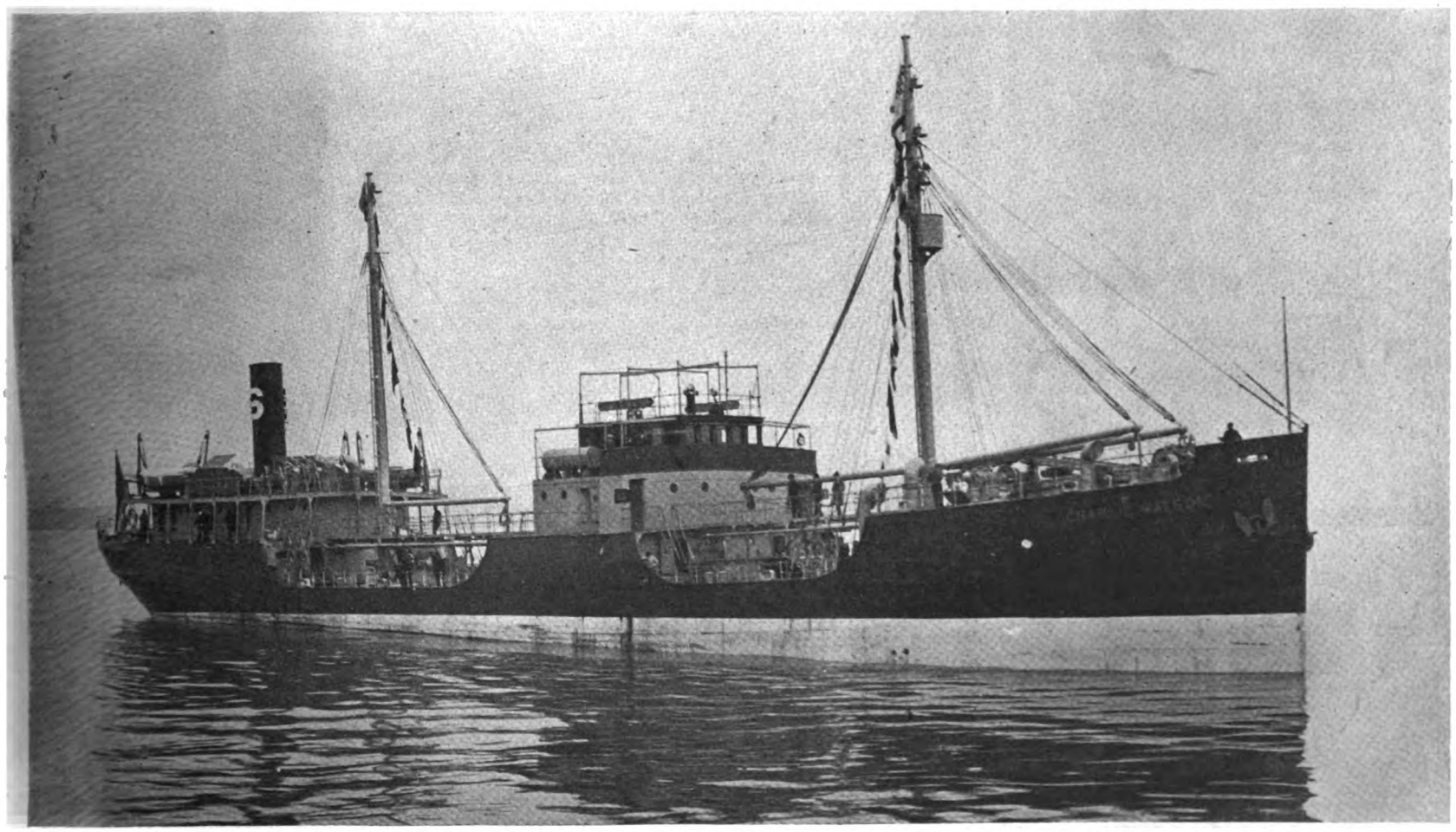
Regarding the maiden-voyage, on account of the swells breaking on the bar, the captain considered it unadvisable to make the trip and put back to San Francisco Bay. While returning from the Light-ship the circuit-breaker threw-off the current throughout the ship with the helm hardover, bringing the vessel close in shore. The captain signalled for full-speed astern on the main Diesel engines and in 11 seconds the engines were reversed, thereby saving the ship from running ashore. Before again starting, the steering-engine connections were made ahead of the circuit-breaker so as to eliminate this dangerous feature, and no more trouble was experienced during the trip.

On Nov. 23rd at 7 a. m. the voyage was again started and the "Charlie Watson" arrived at Point Wells, Nov. 26 at 3 p. m., making an 80-hours non-stop run, averaging ten knots with very small variation of speed throughout the entire trip. This was remarkable considering the heavy head winds bucked for many hours. A 60-mile gale was encountered while going up the Sound, but the tanker still maintained the 10-knot speed, due to the excellent governing feature of the engines.

During the trip the British steamer "Statesman" —a vessel designed for higher speed—ran alongside the "Charlie Watson" for an entire day on the first day out. The steamer with safety-valves blowing would pull ahead of the motor-tanker a slight distance, but at the end of each watch, when the fires were cleaned the "Statesman" would fall astern, and could not catch up again until the fires were going good and the safety-valves were blowing. This incident shows the advantage of Diesel propulsion in that there was no fluctuation in the speed. It is the steady plugging that counts over the year's operation.

While the "Charlie Watson's" engines are 550 shaft h.p. they were only called upon to develop 400 shaft h.p. each at the rated-speed of 165 r.p.m. Calculations showed about 16% slip in the propellers.

On the return trip she left Point Wells Sunday, Nov. 28, at 8 a. m. There was some little trouble with the exhaust-valves sticking. Then she put back to Seattle to make slight repairs to the anchor windlass. After making the repairs the tanker left Seattle Monday, Nov. 29, at 4:30 p. m.,



First American Werkspoor Diesel-engined motorship—The Standard Oil Company's (Cal.) motor-tanker "Charlie Watson"

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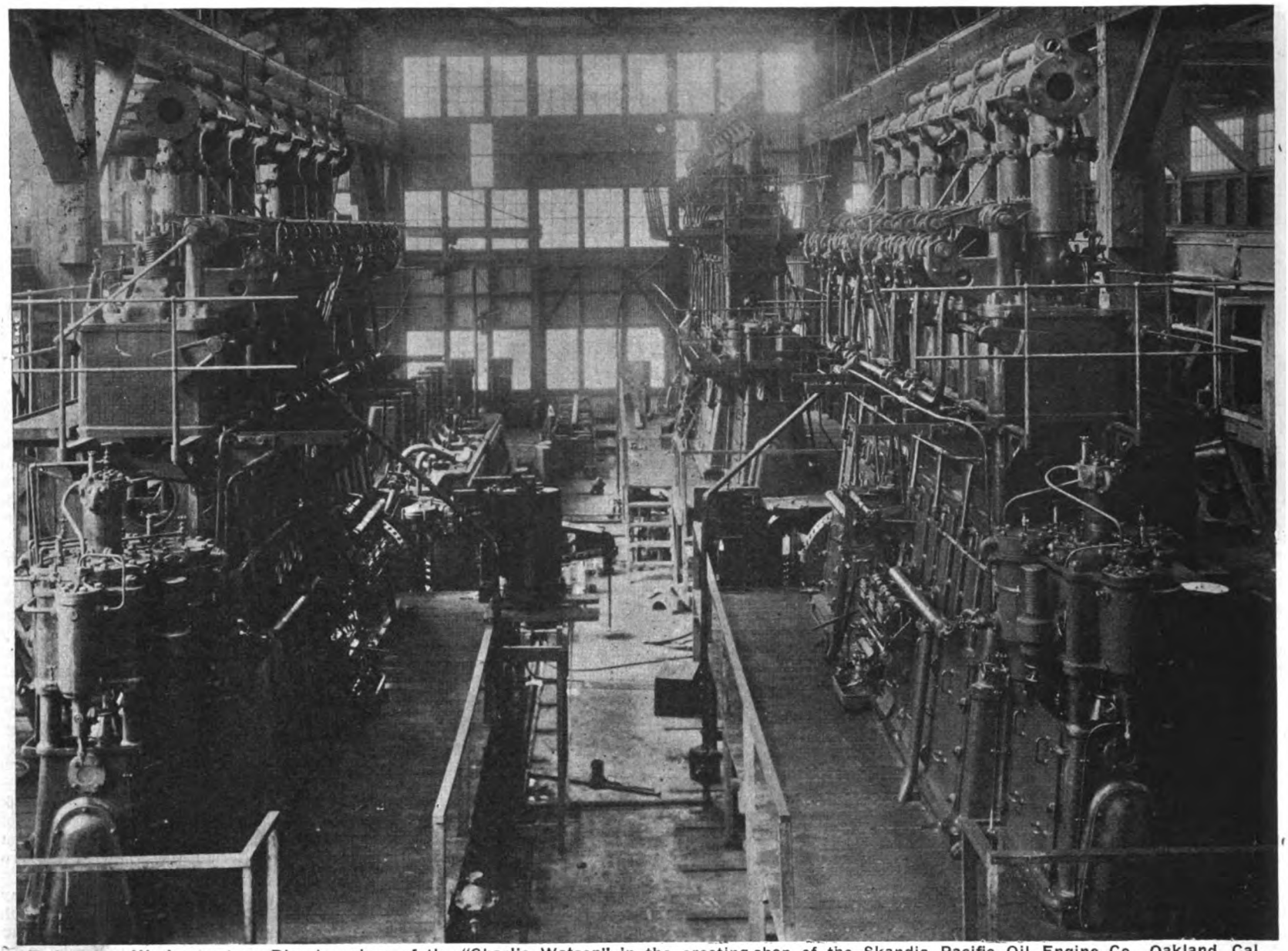
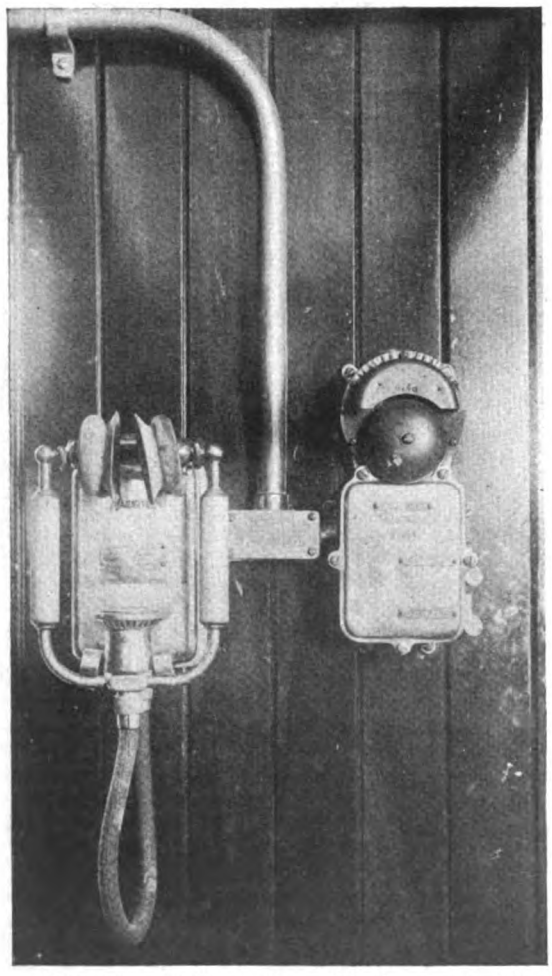


Twin-screw Werkspoor-type Diesel engines of the "Charlie Watson" in the erecting-shop of the Skandia Pacific Oil Engine Co., Oakland, Cal. In the back-ground can be seen one of the 850 shaft h.p. Skandia Werkspoor engines of the Standard Oil Co.'s tanker "F. H. Hillman," originally built for the U. S. Shipping Board



Magnavox loud-speaking telephone on the "Charlie Watson"

and arrived at Point Richmond Friday, Dec. 3, at 10 a. m., a total of 89½ hours, but traveling about 30 miles further than on the trip to Point Wells. Due to the weather conditions and the light condition of the boat, she was run at slow-speed part of the time. During favorable weather she made 11 knots.

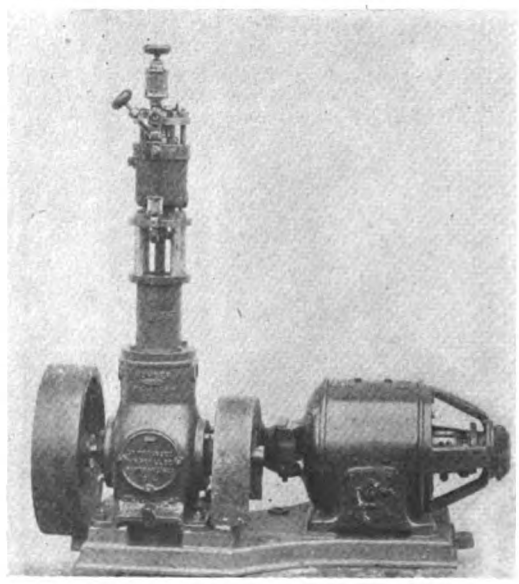
There was practically no vibration from the engines, either the main or auxiliary. In the engine-room there are two 100 k.w. General Electric generators, each driven by a 150 b.h.p. Dow four-cycle type three-cylinder Diesel engine. The following is a description of her electric-driven auxiliaries:

One 9 in. x 4 in. x 6 in. Rix Duplex Tandem 2-stage air-compressor mounted on cast-iron bed-plate with a 50-h.p. 230 volt General Electric, direct-current compound-wound motor operating at 1075 r.p.m., and starting rheostat. The intercooler is removable and is vertical type, fitted with copper tubes secured in a bronze head. The compressor is of the duplex tandem type, with 150 cu. ft. displacement. This compressor is capable of drawing from the atmosphere and discharging at 350 pounds to the square-inch.

There is one Rix 1⅛ in. x 4½ in. Rix booster-compressor mounted on a cast-iron bed-plate, driven by a 5-h.p. 230 volt, direct current, compound-wound General Electric motor, operating at 1700 r.p.m., the motor being equipped with rawhide pinions and cast-iron gear-guards. Splash oiling in the crank-case and plunger is fitted with both oil and soapy-water lubricator. This compressor is capable of taking air at 350 lbs. and boosting it to 1,000 lbs. This unit is equipped with a starting rheostat.

Crane valves and Wallworth pipes are used for the cargo lines from the tanks to shore. These pipes have an eight-inch discharge. The cargo-oil system of piping is so arranged that three grades of oil may be carried and handled simultaneously without mixing, either in loading or discharging. Her carrying capacity is approximately 16,000 barrels of refined-oil, together with thirty days' supply of fuel, fresh water and stores. This capacity is well-worth comparing with a steam-tanker of similar overall dimensions.

All motors in the pump-room are gas-proof and of the ventilated type, to exclude accumulation of gases in the motors where sparking may occur. For the purpose of steaming-out the cargo tanks a donkey-boiler is installed in the engine-room. This donkey is equipped with the Ray mechanical fuel-oil burning apparatus, manufactured by the Ray Oil Burner Company, San Francisco. An



Rix booster used in conjunction with one of the auxiliary air-compressors in the "Charlie Watson"

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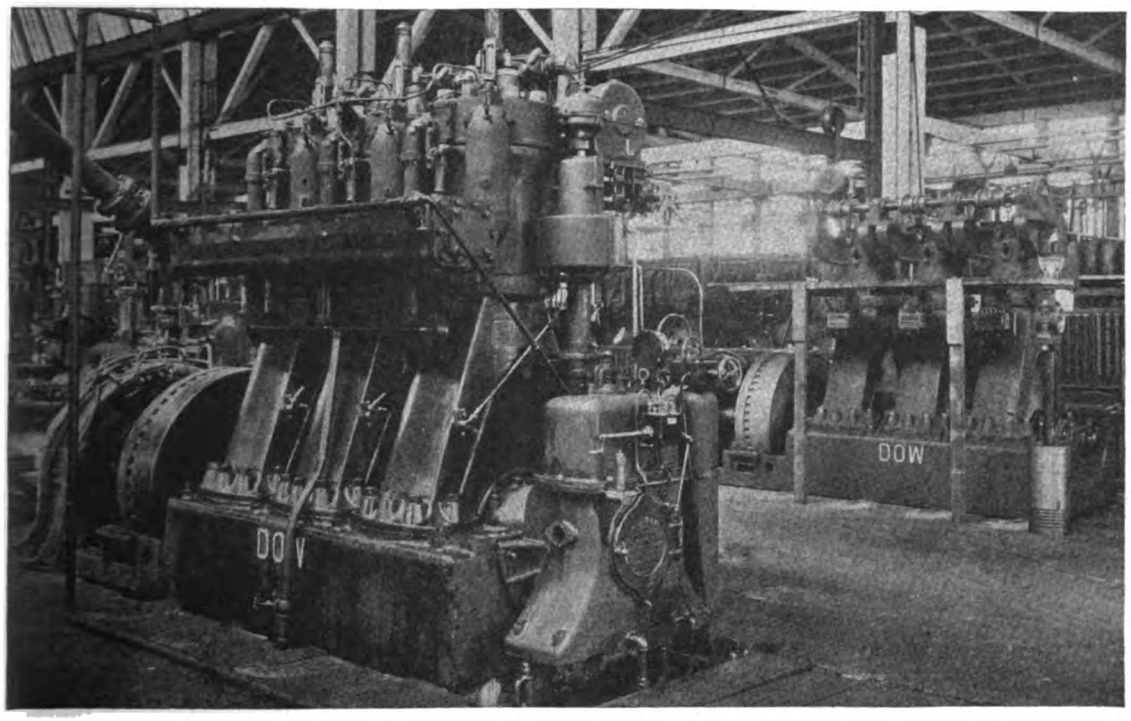


The two Dow Diesel engines used as auxiliaries on board the "Charlie Watson"

electric heater is attached to the donkey-boiler for heating boiler-water for getting up steam quickly. This keeps the water in the boiler heated at all times and operates on a plan similar to water-heaters in fire houses. The fuel-oil is atomized in the Ray oil-burner by a small centrifugal pump. A Worthington feed-pump for the donkey-boiler is installed.

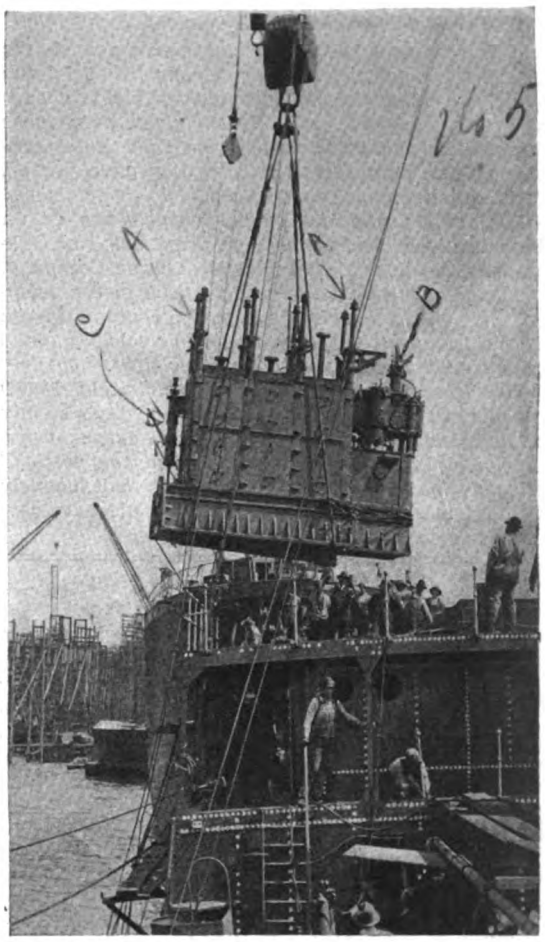
There is one ice machine of the Johns Manville type; one machine-shop lathe operated by a 2-h.p. electric motor, furnished by Manning, Maxwell and Moore of San Francisco.

There is one centrifugal two-stage Alsburger fire-pump driven by a 30-h.p. G. E. motor operating at 1700 r.p.m. A rheostat control gives variable speed to this motor. This is placed on the port side of the engine-room, and pumps into the fire-line that extends throughout the vessel. The pump is gear-driven. Another fire prevention installation is the Foam fire-extinguisher plant, similar to those the Standard Oil Co. has installed on land wherever it has large quantities of oil in storage.

There is a centrifugal bilge-pump operated by a 2-h.p. G. E. motor, and adjacent to this is a sanitary pump of the centrifugal-type driven by a 7½-h.p. motor which pumps salt water, and a fresh-water pump operated by a 3-h.p. motor.

There are three pumps two of which are circulating pumps for the water coolers on the main engines. These pumps are gear driven, each being operated by a 10-h.p. motor.

The cargo-oil pumps are placed under the forward deck, there being a special control-room on the main deck forward. These consist of four rotary pumps direct connected by gear to 30-h.p motors operating at 800 r.p.m. These motors are ventilated by a blower system, the blower being placed in the electric control-room. There is an emergency pump in the pump-room for use in case there should be a shortage of fuel-oil for the main engines. By means of this pump it is possible to pump from any cargo tank to the fuel tanks placed aft. This pump is driven by a 10-h.p. motor connected by a gear.

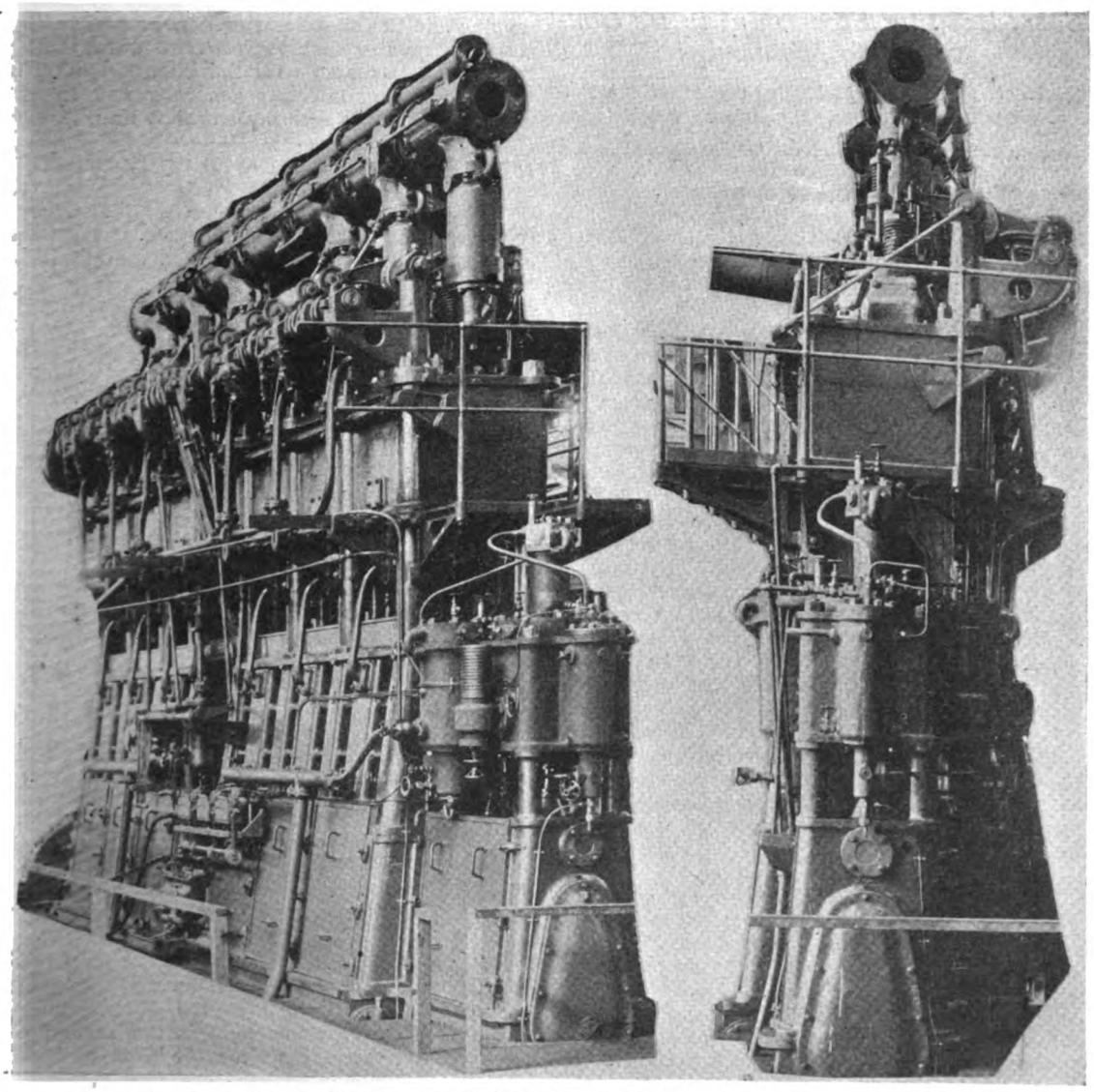


Lifting the forward three-cylinder section of one of the main engines of the motor-tanker "Charlie Watson"

There are two centrifugal lubricating-oil pumps each driven by a G. E. 3-h.p. motor. These are placed aft on the main-engine deck. There is one fuel-oil pump for the engines located on the forward bulkhead of the engine-room and driven by a 3-h.p. electric motor.

For emergency cases there is a 10-k.w. G. E. 250-volt generator, which can take care of the lighting system if necessary. There is a 3-k.w. balancer set located forward of the engines on a level with the Dow Diesel engines, for the lighting system. The 250-volt 2-wire balancer set gives 3-wire 125 volts for the lighting system.

There are two turning motors, each operated by a 5-h.p. motor placed aft of the main engines, which are used in turning the main engines a trifle. A worm-gear is designed to engage the fly-wheel. There is a siren placed over the pilot house and driven by a 2-h.p. motor at 3,500 r.p.m., which was furnished by the Federal Electric Co. of Chicago, Ill. The switches for the various running lights are provided with pilot-lights to indicate that the running lights are in working order. Electric heaters are installed throughout the vessel. Other electric equipment includes a Donkin hydro-electric telemotor and electric indicator. The Magnavox loud-speaking telephones came in to good advantage during the maiden-voyage. One phone is installed in the pilot-house,



The twin-screw 500 shaft h.p. Skandia-Werkspoor Diesel engines of the motor-tanker "Charlie Watson." They are of the cross-head type. Few marine-oil engines of this power are built with cross-heads

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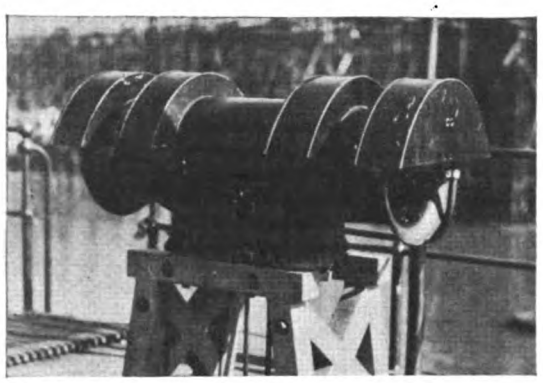


Federal electric siren installed on the motor-tanker "Charlie Watson"

which connects with the engine-room and the steering-engine room. By means of this the steering-engine can be operated by hand in case of emergency, the orders being given over these phones. It should be understood that the electrical cooking equipment in the galley gave perfect satisfaction on the maiden-trip.

Her two propelling Diesel-engines are of an Americanized Werkspoor type constructed at Oakland by the Skandia Pacific Oil Engine Company.

The "Charlie Watson" will be used in the coastwise trade, transporting oils to the regional plants of the Standard Oil Co. She will probably make trips to Alaska during the summer time.

Her carrying-capacity is approximately 16,000 barrels of refined-oil, in addition to 30-day's supply of fuel, fresh-water and stores. The cargo-oil system of piping is so arranged that three grades of oil may be carried and handled simultaneously without mixing, either in loading or discharging.

The "Charlie Watson" has the following dimensions:

Deadweight-capacity	2,800 tons
Carrying-capacity	16,000 bbls. (2,285 tons)
Fuel-capacity	2,700 bbls. (385½ tons)
Fresh-water capacity	44½ tons
Cargo-space of forward hold	15,000 cubic ft.
Power	1,100 shaft h.p. (1,300 ind. h.p.)
Engine-speed	165 r.p.m.
Cruising radius	30 days
Length (O.A.)	262 ft.
Length (B.P.)	250 ft.
Breadth (Md.)	37 ft.
Depth (Md.)	21 ft.
Draught (Loaded)	17 ft.
Draught (Mean)	18 ft. 3 in.
Daily fuel-consumption (at sea)	4½ tons (31 bbls.)
Daily fuel-consumption (in port)*	1½ tons (12½ bbls.)
Speed (Loaded)	10½-11 knots

*With all cargo-pumps, etc., working

Those who were on the trial-trip (which lasted about eight hours over the prescribed course) were the following:

A. J. Hanna, director, Standard Oil Co. of Cal.

J. C. Rolfs, genèral manager, Standard Oil Co. (Marine Dept.).

James Cronin, engineer, Marine Department Standard Oil Co.

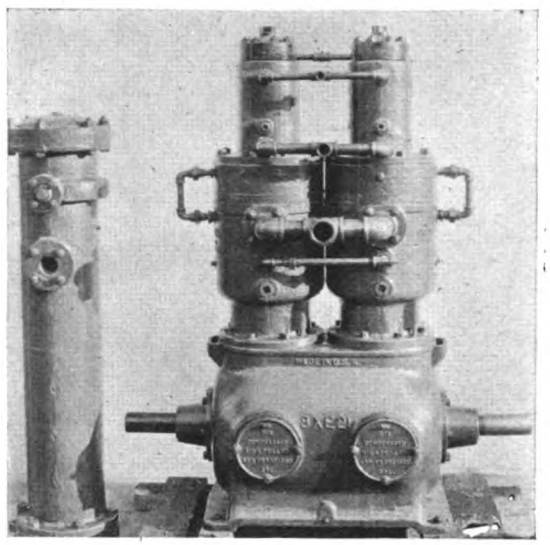
Mr. Gardner and Mr. Knapp of the Union Construction Co.

E. N. Persey, U. S. Shipping Board

Mr. Ryan, San Francisco office of General Electric Co.

Mr. Van der Woert, engineer of Skandia-Werkspoor Co.

The "Charlie Watson" was named in honor of Charlie Watson, superintendent of construction, Sales Department, of the Standard Oil Co. of Calif., until last December, when he retired after having served 38 years with the Standard Oil reorganization. Every city and town on the Pacific Coast where the company has established stations has at one time or another in years gone by been a port of call for the original "Charlie Watson." He knows the coast from Nome to San Diego, and it knows him, too! There will be many a smile of satisfaction and a stirring of pleasant recollections when his namesake pulls into coast ports for the first time.



Rix air-compressor as installed in the engine-room of the motor-tanker "Charlie Watson"

Admiral Benson and Diesel-Electric Drive

Some Existing Steamships to Be Converted to Motorships

(Extracts from Address Before the American Petroleum Institute, November, 1920.)

TO compete in the world markets with our ships it is necessary to continue the development of oil for the application of fuel-oil to our motive power, and in order to reduce the operating expenses and make shipping a profitable enterprise there is no one element that is so important as that of reducing the quantity to be used to the smallest possible amount. It would be useless for us to try to compete with our foreign competitors by returning to coal.

What we are doing in the Shipping Board is to try to develop a motive power that will reduce the amount of fuel-oil required. My own opinion is that the answer to the problem will be the development of an internal-combustion engine as a generator of electricity, and then using the current so generated for driving the motors that drive the ship. We have one large vessel, the "Eclipse," which is now on a voyage to the East Indies with careful engineers. They are collecting the data and tabulating them. This data will be fully analyzed on the vessel's return. In this case the electric current is generated by the steam turbo-generators similar to the type that is used in our battleships; and as you know, that has been shown to be very economical.

The engineers with whom I have discussed the question of the Diesel-engine principle as applied to a generator seemed to think that there are some difficulties that are insurmountable. While I am not an engineer, it seems that there is some practical point between the Liberty motor and the ordinary Diesel engine that can be applied for generating electricity, and, of course, we know that having gotten the electric current, the rest of it is a simple and practical proposition.

Another reason that I am strongly in favor of the electric-drive, particularly in merchant-ships, is shown by the fact that it was due to my persistent efforts that the electric drive was retained in our battleships.

In the merchant-ship one of the most expensive elements is the auxiliary, and it is a very self-evident proposition that if we can produce an electric current by an internal-combustion engine and then carry the current to any part of the ship through the wires and cables we will have two forces that are simple and well-understood and their application thoroughly practical, and you use neither fuel nor energy except when you absolutely need it. The loss from the generator to the point of application is very small.

So that from a purely common-sense, practical view-point it seems to me that that is the solution of the problem in our merchant ships.

We have another vessel, the "William Penn," being completed now at the Cramp's Yard, where we have a Diesel engine with certain modications and improvements, the details of which I am not familiar with, but I am informed that they expect to get very excellent results. She will very soon be completed and put on a long voyage, probably going to the East Indies and I know that the engineers who are working with the "William Penn" believe that in that type they will get better results than from the electric drive. That may be compared with the steam-turbine electric-drive, but the point that I feel that we should work for is the internal-combustion engine principle applied to the electric-generator, and then the current used for driving the ship and driving the auxiliaries of the ship.

If we find that the Diesel engine—directly coupled or the electric-drive—whichever one proves the more economical, it will be installed. As the steam engines now installed in existing vessels become worn-out, or if the economy is sufficient to warrant it, the engines will be removed and new motive power will be put in.

We have one case now of a company that is very much interested in taking one of our vessels and removing the engines and boilers. This company has estimated very carefully as to the saving in cargo space, in the number of men that will be necessary to attend to the machinery, and all of the various elements that would enter into the problem; and the offer is so inviting that the board feels very much inclined to turn over a vessel at a very reduced price that will warrant the company in taking the engines and boilers out and putting in this new arrangement of the Diesel engine and the electric drive. Of course, in all of this we require that very careful data shall be taken and tabulated with the intention of giving to the shipping interests generally any information that we may secure along that line.

ANOTHER LARGE STEAMSHIP CHANGED TO DIESEL POWER

A steamship of 9,000 tons d.w.c., which recently commenced construction at the yard of the Copenhagen Floating Dock, will be changed to Diesel-engine power by order of the owners—the Atlanterhavet Shipping Company—and twin-screw Burmeister & Wain Diesel engines will be installed. The Copenhagen Floating Dock is the next largest shipyard in Denmark to Burmeister & Wain. When completed the new vessel will be very similar to the well-known motorship "Oregon" owned by the United Steamship Company of Copenhagen, and which some time ago was chartered by the American Hawaiian Steamship Company of New York.

SMALL GERMAN-BUILT MOTORSHIP FOR SWEDISH OWNERS

"Yara," a 450 tons motorship, has been launched at the Vereinigte Elbe und Norderwerft (Shipyard), Boitzenburg, Germany, to the account of Swedish owners.

"CLAUDIA M" A BRAZILIAN MOTOR-SCHOONER

For Brazilian owner, the shipyard of J. J. Pattje & Zonen, Waterhuizen, Groningen, Holland, recently launched the motor auxiliary schooner "Claudia M" of 650 tons d.w.c. She is propelled by sails and by a four-cylinder, two-cycle, surface-ignition type Kromhout engine.

LAUNCH OF CONCRETE MOTORSHIP "POSEIDON"

A Diesel-engined motorship of concrete construction and of 1,350 tons d.w.c. was recently launched at the Codan Shipyard, Koge. She has been named "Poseidon" and is the second concrete motor-vessel built for the Torben Nielsen Shipping Company. There are now two motorships afloat named the "Poseidon"—the other being the Anglo-Saxon Petroleum Company's Werkspoor Diesel-engined steel tanker.

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Convert a Million Tons of Steamers to Diesel Power or Build Big Fleet of Motorships—Says Denman

Extracts from the testimony of Mr. William Denman, former chairman United States Shipping Board and president of the Emergency Fleet Corporation, Before the Select Committee on United States Shipping Board Operations, House of Representatives.

Washington, D. C., Monday, December 13, 1920.

HON. JOSEPH WALSH (Chairman), presiding. Also present—Representatives Kelley, Hadley, Foster and Connelly.

The Chairman. Mr. Denman, when were you appointed to the Shipping Board?

Mr. Denman. My appointment was made in the month of November, 1916. It was confirmed in January, 1917, and the board was organized on the 30th day of January, 1917. I had previously been one of the active participants in the framing of the legislation, beginning back in the latter portion of 1915.

When I proposed to the President the method of division of the powers conferred on him by the Congress in the Act of June 15, 1917, the executive orders that I outlined and suggested made a complete division between the operation of ships as commercial agents, and the construction of ships; and the executive order that was sent to us by the president, following the outline that I had submitted to him, divided the functions of the Shipping Board into two, (1) the construction of ships, and (2) the operation of ships. The manufacture or construction of ships was to be in the Emergency Fleet Corporation——

The Chairman (interposing). Pardon me, but was that possibly in contemplation when the title "Emergency Fleet Corporation" was adopted?

Mr. Denman. I put the word "emergency" into that title to indicate the emergency character of oil-fuel steam engines and wooden hulls. One of them was obsolete, that is, wooden hulls were obsolete as a commercial type when we adopted them. The oil-burning steam-engine had its obsolescence already forecast by the leading shipping men of the world, including Lord Admiral Fisher.

I came in contact with the oil situation, as assistant attorney-general of the United States in control of oil litigation at its beginning, and there made a study of oil conditions. I was attorney for Fred. Olsen's fleet of Diesel motorships, and for a long time before I went on the Shipping Board had been largely operating those ships between Scandinavia and the United States. I have operated ships myself. In fact, I have sailed two wooden Hough ships during the last two years over 120,000 miles on the Pacific, and have carried over 200,000,000 feet of lumber. I know something about the wooden ship, and its obsolescence, and its small remaining usefulness.

The Chairman. Did you, while you were chairman of the Board, make any contracts for Diesel engines?

Mr. Denman. The Diesel project I brought to the Board as my contribution to the commercial feature of the American Merchant Marine. The Diesel motorship has been used on the seas from 1904, very largely in the Baltic and Black Sea trades, and——

The Chairman (interposing). Perhaps you can answer this question: Did you make any contracts for the Diesel engine while you were chairman of the Board.

Mr. Denman. I procured a plant, the license for the Burmeister and Wain Diesel, the standard Diesel of the world then, and which has been adopted by Lord Pirrie and others for use in Diesel manufacturing plants in Great Britain—

The Chairman (interposing). Can't you tell us whether you made any contracts for Diesel-engined ships?

Mr. Denman. Oh, yes. We did not get further than the presentation of the contract for our signature; it was not signed by the Board.

The Chairman. Will you give us the reason why the contract was not signed?

Mr. Denman. Because they were debating as to whether or not we would accept the contract, or would commandeer the plant and run it as a national project. That was to be settled on July 24, the date that we both resigned.

The Chairman. Before I ask you with reference to this Diesel proposition, when first did you know that you were to resign?

Mr. Denman. On the 24th of July, 1917.

The Chairman. Were there any plants in the United States manufacturing Diesel engines?

Mr. Denman. The following plants were manufacturing Diesel engines:

1. Nordberg Manufacturing Company, Milwaukee, Wis.
2. McIntosh & Seymour, Auburn, New York.
3. Skandia-Pacific Oil Engine Co., San Francisco, Calif.
4. Dow Pump & Diesel Works, Alameda, Calif.
5. Worthington Holly Works, Buffalo, New York.
6. Fulton Iron Works, St. Louis, Mo.
7. James Craig Diesel Works, Jersey City, N. J.
8. Midwest Engine Works, Indianapolis, Ind.
9. Winton Engine Works, Cleveland, Ohio.
10. New London Ship & Engine Company, Groton, Conn.
11. Busch Sulzer Diesel Works, St. Louis, Mo.

The last two were manufacturing for the Navy. You will recall that the Navy made very large use of Diesels before anybody else did in this country.

Now, these companies were manufacturing land Diesels, and some small marine Diesels, but the standard Diesel license at that time was not being utilized in the United States. All of these factories could have manufactured standard Diesels of the type used in the Danish East Asiatic fleet for many years before I went on the Shipping Board.

The Chairman. Had the manufacture of Diesel engines at the time you were chairman of the Shipping Board progressed beyond the experimental stage?

Mr. Denman. I hand you, sir, a photograph (group-picture) of 21 ocean-going Diesel-ships, then sailing the seas, and of tonnage running from 6,500 tons deadweight to 10,000 tons deadweight. This is a single fleet, the output of a single yard. Nearly all these ships were operated by the Danish East Asiastic Company, which sailed from Copenhagen through the Mediterranean to the East Indies, up the China coast, across to San Francisco, and around through Magellan, and then to Europe. Many of these vessels were for over a year at sea and no engine troubles developed that at any time interfered with their operation. They consumed about one-third the amount of fuel that our oil-burning turbine engines consume; and because they have no boilers and no condensers, and because they only have to carry one-third of the amount of fuel, which is carried in their ballast tank, they have an increase of 12 per cent in cargo-capacity over the ordinary commercial types of tramp steam-vessels. It was the administration, these years of use of these vessels, that had satisfied every man who knew the world game of shipping that these were the only things to be used by a nation having a fuel-oil supply, long voyage commerce, and bulk cargoes to be carried.

The Chairman. How many contracts you had signed for Diesel engines; or, how many ships had you negotiated contracts for that were to be equipped with Diesel engines?

Mr. Denman. The project which we had was primarily for the manufacture of engines; to get established in this country—

The Chairman (interposing). For how many?

Mr. Denman. They were to turn out in the Cramps organization 24 Diesel motorships of 9600 tons deadweight capacity, with a gain of 12 per cent over the other types. That is to say, they would have been 12 per cent over the 9600 deadweight capacity of steamers, and of 11.6 knot speed on trial trip.

Now, this limitation of 24 ships was a limitation of the yard's capacity, of the Cramps yard, and contemplated two years' construction. The engines and the engine plant could be tremendously expanded, from the license used in other Diesel-engine plants, which I have described here, and a vast fleet of them could have been prepared for. The Diesel engine consists of some 4 to 6 units arranged along a shaft in very much the same way as the cylinders are arranged in an automobile. The consumption of oil, however, or rather the burning of oil, is entirely different from that in the case of the automobile, as it is not by explosion in the cylinders of gas as in the case of the automobile but combustion or burning of oil in the cylinders of the Diesel engine. These 6 units would be smaller in size and have smaller parts, but of similar power to steam reciprocating engines, and the multiplication of parts by the process we Americans are familiar with would have enabled us to turn out very large numbers of Diesels, probably as rapidly as we did our steam-engines.

The Chairman. If I understand your testimony correctly it is that while these various firms you

"The purpose of my appearance before this committee is to urge the revival of my project as Chairman of the Shipping Board to build a large fleet of Diesel motorships. Its rejection was the climax in the tragedy of misfortunes of the Hurley administration.

"The United States can only balance its fleet by adding or converting from steam at least one million tons of motorships. We should stimulate the building of Diesel factories and produce more than our British and Scandinavian competitors.

"If we do not, we have lost the battle for maritime supremacy, and will not have even a fair minor share in the world's sea carriage."

—Extract from Wm. Denman's testimony before the Congressional Committee.

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have enumerated were making Diesel land engines and small Diesel marine engines, none of them had manufactured Diesel engines of sufficient size and power to be installed in these ocean-going steamers, not until the time that you had laid out this program.

Mr. Denman. They had built many engines of size and power, but they were not marine engines. In other words, they were equipped to build marine engines provided licenses and drawings were furnished to them.

The Chairman. Was there a single steamship company operating, a United States corporation, an American steamship company, that had any ship constructed in which had been placed the Diesel engine, at the time you were chairman of the Board?

Mr. Denman. You will remember that our American Merchant Marine was not particularly prosperous during the war, and that during the earlier years of the European War there was very little stimulation of it.

The Chairman. But were there lines operating ships in which were Diesel engines that visited American ports?

Mr. Denman. Yes; the Danish East Asiatic Company, the Swedish East Asiatic Company, Fred. Olsen's line, and others. The first Diesel to come into the port of San Francisco was the "Siam," a 10,000-tonner, which arrived there in the year 1913. I remember that the entire water front group, the shipping group, went down and visited her. There had been a number built before her. She made a voyage around the world, and I think one or two voyages, with this consumption of oil I have described. Among the ships coming in, of the fleet that I represented, Olsen Fleet, there was a 9,600 ton Diesel-engined ship, the "George Washington," which I, as his broker or agent, chartered to the Navy in the fall of 1916. She carried coals from the Delaware Capes to the San Francisco Bay, and made the voyage with her usual economy and efficiency. The "George Washington" was one of the later built vessels, before I went on the Board, but the designs were very little different from the "Selanda," which was of the first group built in 1912, and started on her first trip in February, 1912. The "George Washington" was afterwards chartered by the Shipping Board, in the fall of 1917, and the Shipping Board experts made a voyage on her. I have seen their report. In every respect it confirms the statements I have made here concerning the efficiency of these vessels. And, that was a Shipping Board voyage and one of the most profitable voyages made by any Shipping Board ship.

The Chairman. Were there any plants in this country that were sufficiently well equipped to have undertaken the construction of marine Diesel-engines for these other ships which were contracted for as the result of the war emergency, on a large scale?

Mr. Denman. Yes; this list I have given you, all of them have been completed in plants manufacturing these large size Diesel engines. It was a question of design of engine and of license to use them, we built and expanded a very large number of steam-engine plants, built new ones and expanded them, and the parts to be made in a steam-engine plant are very much larger than the parts to be made in these plants. The metallurgical defects in the Diesel which bothered the Diesel manufacturers in 1904, 1905 and 1906, had all been solved. Our mechanics, men who turned out automobiles and the Diesel engines for submarines, our mechanics in this country are as skilled in construction and even more so than mechanics in Europe. It is all hocus pocus and a defeatist policy to talk about the superior ability of Danish and Swedish and other European mechanics. They have not come up to us in the matter of motor vehicles of any kind.

The Chairman. Had any policy been adopted in the Board prior to your resignation for the construction of any large number of Diesel ships, outside of these 24 that had been arranged for?

Mr. Denman. Yes; the policy of developing a plant for the construction of engines beyond the hull capacity of the Cramps yard.

The Chairman. But, Mr. Denman, you had already signed contracts for some 400 ships, and there were some 70 or 80 other contracts on your desk awaiting signature. Those contemplated putting in the steam marine-engines, did they not?

Mr. Denman. Oh yes. We had the plants. We had to get the tonnage. The sinkings by submarines in the months of February, March, April and May, in which we developed our program, were at the rate of 13,000,000 deadweight tons per annum. Sinkings in the months of May and June would have equalled all the wooden ships at our highest estimate of production, in two years; just two months of sinking would have equalled that production, and a shade over. We had these large steam engine plants in the country, and of course the only thing to do was to build every steamship we could. The idea I had was that when we came to expanding any then existing steam plants and building new steam plants, that some of this billion dollars we were spending should go in for these matured types of Diesel engine—not that the whole thing should be steam production, but that we should carefully insert in the American fleets this type of engine.

The Chairman. Do you know of your own knowledge whether or not those contracts were signed by your successors?

Mr. Denman. They were not.

The Chairman. Do you know of your own knowledge whether any Diesel-propelled ships were contracted for by the Shipping Board after you resigned?

Mr. Denman. Not one. In all the eight million tons that we had contracted for there was but one motorship, which has not yet reached her trial trip. The engines in that ship were procured from Burmeister and Wain, in Copenhagen, and sent over here, and they waited here for nearly a year before they installed them. And the vessel has not yet been tried out.

The disputes that the fleet of ships—and three times as many are on the sea, with Burmeister and Wain engines—the dispute that they are talking about, that this ship is of an experimental type, and that they are experimenting with the Diesel engine, which for 8 years has been sailing the seas everywhere, and for whose efficiency reports are available, the Danish East Asiatic Company puts out its statements—and they will give any information that we want—I say, there seems to be that dispute, and we are talking about experimenting with a Diesel-engined ship sometime within the next eight months, and it is all in the face of this experience that I tell you about.

The Chairman. We have had some testimony to the effect that some Diesel engines were being constructed in a certain plant, and which engines had been tried out and proved to be failures. Do you know of any such engines having been made for the Shipping Board, of your own knowledge?

Mr. Denman. Well, of my own knowledge it only goes to points I have read in the technical journals. No contracts have been let for Diesel engine units of sufficient size to propel a 10,000 ton or 8,000 ton vessel at proper speed for modern commerce. Some small engines were ordered to be constructed in several plants, but none of them would have been commercially available in competition on the sea. Whether or not they were a success I do not know. But I do know that not a dollar of these billions of dollars that have been spent has been spent for the construction of a Diesel engine of sufficient size to drive any 10,000 ton ship at a speed of 10 knots.

The Chairman. Did you procure these licenses in your official capacity as chairman of the Shipping Board?

Mr. Denman. They were procured through the Cramps who operated on an American license, but they did not have the drawings that they wanted and through Frank Polk correspondence was taken up——

The Chairman (interposing). Through whom?

Mr. Denman. Frank Polk, Assistant Secretary of State. Correspondence was taken up with the Danes, and the equipment that the Cramps people desired, or the information they desired, was secured.

The Chairman. Were they in any position to have undertaken the construction of these Diesel engines had the contract been signed?

Mr. Denman. Beyond any question!

The Chairman. Why didn't you sign the contract?

Mr. Denman. These contracts were presented to us two days before our resignation. We were discussing whether or not we would commandeer the plant and make it a national scheme, like the Hog Island scheme and we were considering whether we would sign the contracts, and, as I say, the request for our resignations came at this time. The first thing I did was to take the matter up with Mr. Hurley. I told him of these other contracts in contract form, ready for signature, that they were in the files of the Shipping Board. I told him of the experience of the Danish East Asiatic Company, and of the Norwegian and Swedish fleets, and urged him to take up the project. I then went to New York, where I met Mr. Fritz Olsen, a son of Mr. Fred. Olsen, and told him what I was trying to do, and he suggested that the "George Washington," a 10,000 tonner, should be put under the American flag, so that the Shipping Board could have a direct and practical trial with it, and study its workings, if they were not satisfied with the innumerable trip reports of all these various owners. I rung up Washington to see if I could get hold of Mr. Hurley, and found he was in Chicago. As I went west I stopped off and spent half-a-day with him at Chicago, and asked him to enter into negotiations with the Olsens' for putting the "George Washington" under the American flag. I wired Mr. Hurley afterwards about it, and he wired back that they were not going ahead on it. I came on again in the following January, and again urged him, and he seemed to be very much interested, but besides writing some magazine articles he has gotten nowhere!

The Chairman. Were you the representative of any firm or ship operator prior to your appointment as chairman?

Mr. Denman. Oh, of a great many. I had had general maritime practice.

The Chairman. Did you represent any Diesel engine manufacturer?

Mr. Denman. No; neither before nor since. As a matter of fact, I have talked with no Diesel engine manufacturer in the last year and a half about Diesels, have not talked with one. I do not have my memorandum here, but I came on to try some cases here in the east, and heard that you were going to call me, and I have availed myself of the library of the "Motorship," a publication in New York. I had some discussion there with some men disconnected from any plant.

The Chairman. Did you represent some steamship line that operated Diesel-engine shipping?

Mr. Denman. Yes, sir; I represented the Olsen line, and it was the Olsen people that offered to put the "George Washington" under the American flag, so that the Shipping Board could have it directly under its inspection.

The Chairman. Was that done?

Mr. Denman. It was not done, but the "George Washington" was chartered by them as I have described, late in 1917.

The Chairman. Did you usually take two days with contracts coming to you, to decide whether they would be signed or not?

Mr. Denman. Oh, it depended on the questions involved. I might take a week. But there was no delay in the signing of contracts. But if you take a pile of contracts that high (indicating about a foot) with the other administrative duties, it cannot be done in the wink of an eye.

The Chairman. You had to sign those contracts, didn't you?

Mr. Denman. Yes, sir; I did.

The Chairman. When you had a pile of contracts such as you indicated a while ago, about a foot high on your desk, didn't you have a brief or a summary of what the contracts contained?

Mr. Denman. No!

Mr. Denman. I was one of the three conferees that sat with the British Commission.

I was also engaged in combating the continued statements that the Diesel-engine was not successful and was in an experimental stage. One of the leading British ship engineers in Washington attempted to tell me that the thing was experimental, but he very quickly changed his tone when I told him I had been attorney for Fred. Olsen's fleet, and knew all about the East Asiatic Fleet, and the 35 odd large size vessels that then were sailing and had for years been sailing on the sea. Josephus Daniels himself said to me "Your English friends do not seem to think much of the Diesel." The same remark was made to me by Mr. Brent, my associate on the Board.

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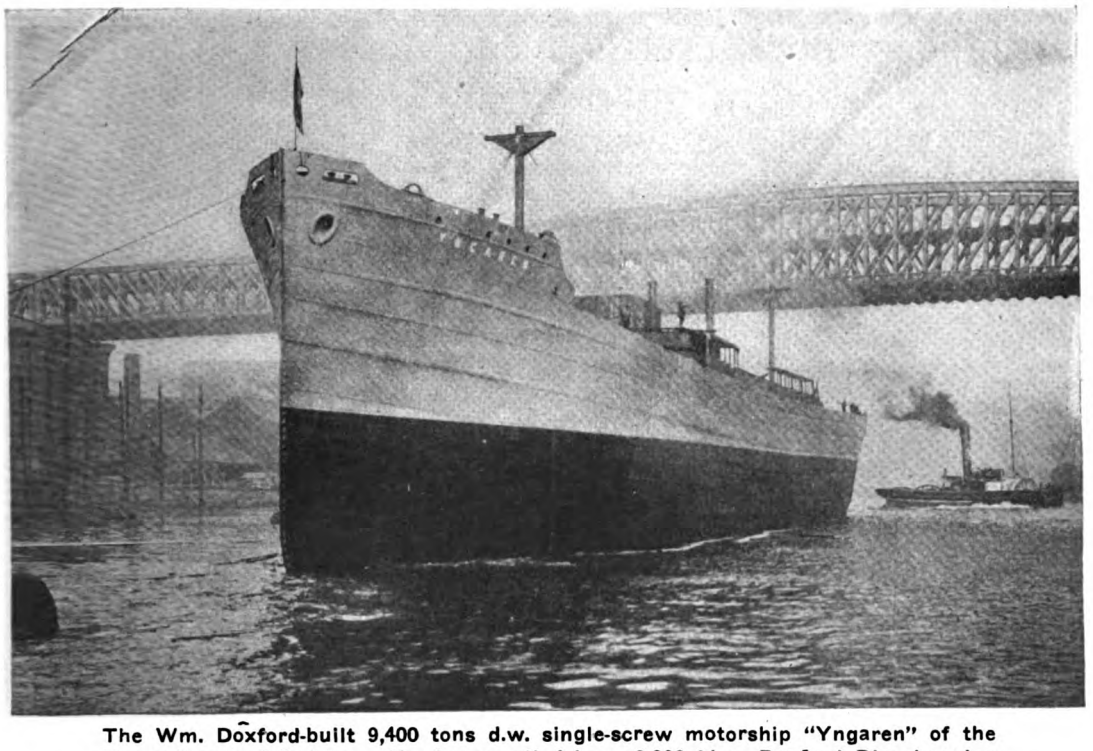


The Wm. Doxford-built 9,400 tons d.w. single-screw motorship "Yngaren" of the Transatlantic S.S. Line. She is propelled by a 3,000 i.h.p. Doxford Diesel-engine at 77 r.p.m., designed to give a loaded speed of 11½ knots. Fuel-consumption 9 tons per day. Radius-of-action at 10½ knots is 32,500 sea-miles.

Everywhere was the urging, not the direct statement, that there was not confidence in the Diesel ships.

Tuesday, December 15, 1920.

Mr. Denman. I desire to offer a statement on the matter of Diesels, which I can be examined upon. The reason I ask to have it placed in the record is because I have drawn together in one place the matters that are scattered throughout my testimony, and so that anybody looking over my policy on Diesels or what I recommend as the future policy of the Shipping Board, may find it in compact form.

The Chairman. Perhaps if you will read it it will be in shape before the committee so that the members of the committee can examine you on it if they so desire.

Mr. Denman. All right. The purpose of my appearance before this committee is to urge the revival of my project as chairman of the Shipping Board, to build a large fleet of Diesel motorships. Its rejection was the climax in the tragedy of misfortunes of the Hurley administration, despite its notable accomplishments.

When I put the word "emergency" into the title of the Fleet Corporation, it was to indicate the war emergency which compelled us to build so many oil-fuel steam-engines, as well as our wooden hulls. The obsolete character of the wooden hull required no explanation. The wasteful use of oil under the steam boilers, consuming nearly three times the fuel of the many existing motorships of the Danish East Asiatic and other fleets, was well known. For years these large motorships had sailed under my window over the Golden Gate. Admiral Lord Fisher had already pointed out the approaching obsolescence of the marine steam engine.

When I became Chairman of the Shipping Board, the East Asiatic Company and other Scandinavian owners, in scores of voyages, some over a year in length and all around the world, had established the paramount commercial value of the Diesel motorship. It was then beyond either practical or scientific question or doubt.

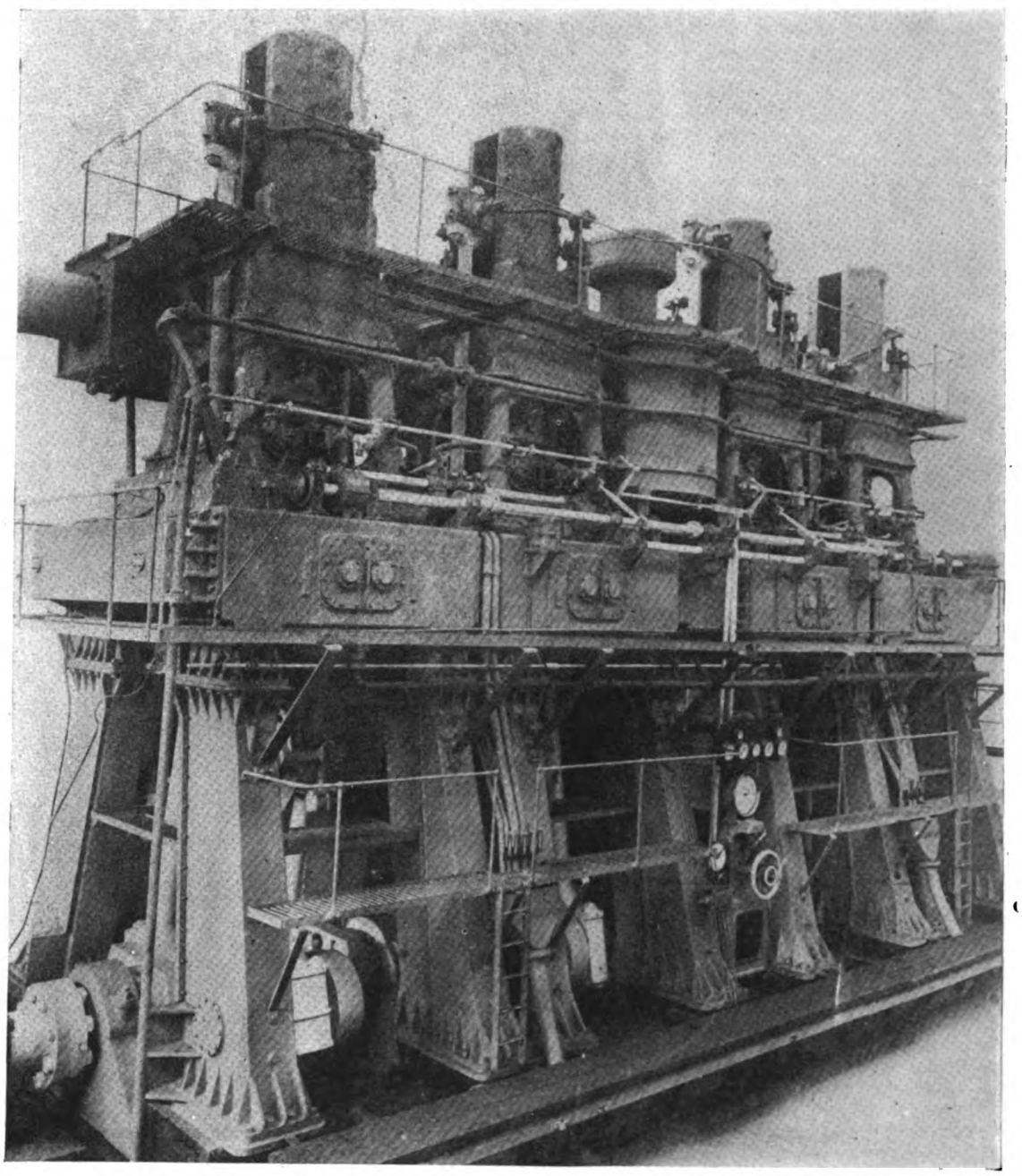
The project for building them, the necessary license, the plant, the Cramps shipyard and the skilled workmen were all procured under my administration. There were many other Diesel plants available for their construction, a list of which I put in the record yesterday. A contract was offered us, and we were debating whether we would commandeer and make it a national project or accept the contract. It was my administration's contribution to the commercial future of the American Mercantile Marine. It would have taken no more time for the Cramps to complete the Diesel plant, than to establish any one of the new plants for steam engines. The contract was for 9,600 deadweight tonners at 11.6 knots speed.

During the war Great Britain, which had many Diesel plants, some making marine and some making other engines, was compelled to turn to building of submarine Diesels. The submarine Diesel is a more complicated and finer mechanism than these commercial marine Diesels, but vast quantities were turned out in the British yards, in those Diesel factories in Great Britain during the activities of the war, and while we were building none with the government money. Lord Pirrie's plant, the Harland and Wolff yard, was using the same license that I procured, and actually constructed the largest commercial marine Diesel-ship at any time built. This was in war time. This ship was the Glenapp, a marine Diesel cargo and passenger ship of upwards of 14,000 tons deadweight capacity and of more than 14 knots speed.

At the present rate of consumption it has been estimated by geologists and practical oil men, that the American oil supply will be consumed inside twenty-five years. This is the occasion of Secretary Colby's note to the British on their mandate over the Mesopotamian oil fields. Can we waste two-thirds of our fuel-oil, thru steam-boiler tubes and up the smoke-stack, in view of this world oil condition?

George Otis Smith, Director, United States Geological Survey, on November 17, 1920, at a meeting of the American Petroleum Institute, said:

"In acknowledging the superior claim of the marine use of fuel-oil, this priority must be qualified by the condition that even on the seas the best use should be made of this invaluable fuel. The marine steam-engine, even of the turbine



Doxford 3,000 shaft h.p. at 77 r.p.m. merchant-marine Diesel-engine. It is of the opposed-piston two-cycle type. Four large single-screw motorships now building by Doxfords are having this engine installed. Complete description of this engine, together with details of the motorship "Yngaren," will be given in an early issue of "Motorship." Great pressure on space forces us to hold over the same.

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type, must give place to the heavy-oil engine, under the rule of getting the most out of a limited resource. The very facts that support the argument for the marine use of fuel-oil—greater efficiency and economy of space and labor—can be cited in favor of the internal-combustion engine of the Diesel type as against the steam engine. The increased thermal efficiency of the new engine with its resulting addition to available cargo space or to cruising radius, is more than 2½ times that of the steam engine. The experience of the Bethlehem Steel Company, is that their new oil-engine ore-carrier, the 'Cubore,' in continuous service between Cuba and Sparrows Point, Md., uses only 36.7 per cent of the fuel-oil consumed by a sister-ship differing only in that it has the most modern type of steam plant. The tremendous economy thus possible in the marine consumption of fuel-oil demands the immediate adoption of internal-combustion engines if the world wants to make the largest use of its oil resources for the longest time."

Our wasteful steam-ships built for the war emergency, are hopeless in competition with these Diesel vessels. Motorships carry no boilers or condensers, and but one-third the fuel. As a consequence they have over twelve per cent more cargo-capacity. This in itself means a handsome profit in ship operation.

Over 60 per cent of the new cargo vessels ordered in Great Britian are motorships. Norway, Denmark, Sweden, and Holland, build nothing else when they can get engines. Lloyd's agents are now inspecting the construction of three hundred sets of oil-engines. The largest motorship is a British passenger and cargo-ship of 15,760 tons deadweight, and 14 knots speed. Six are of 14,000 tons deadweight and over.

This is active construction in Great Britain. There are 15 marine Diesel engine factories in Great Britain alone. Lord Pirrie controls four of them, three in Scotland and one in Ireland, using the same license we procured for the Board's program in 1917. There are many more in Holland, Denmark, Sweden and Norway.

In all the billions the government has spent, not a dollar has gone to build a Diesel engine large enough for a 10,000 ton freighter. Our wasteful steam engines are dependent on British bunkers. We cannot carry enough fuel to pay the loss up the smoke stack, and complete our long voyages. We must stop and beg fuel supply at the British and other bunkering stations on the China Coast, in Japan, in the East Indies, at Suez, at Aden, in the Mediterranean and in the South Atlantic. The sailing-radius of a 10,000 ton Diesel ship is 28,000 miles on the oil in her ballast tanks. This is once around the world, past all the British and other bunkering stations, and "then some," as shipping men put it.

The United States can balance its fleet only by adding, or converting from steam, at least a million tons of motorships. We should stimulate the building of Diesel factories and produce more than our British and Scandinavian competitors. If we do not, we have lost the battle for maritime supremacy, and will not have even a fair minor share in the world's sea carriage.

I have here a statement giving a partial list of Diesel-driven merchant-motorships at present building in Great Britain, which I will ask to have copied into the record. Only about one-third I think of the yards, or half of the yards, are shown here. The others have not reported out.

But this list totals 65 ships of 583,600 deadweight tons, and 227,800 indicated horsepower. I have a summary at the foot of this statement showing the fuel saving on this fleet. I won't repeat that. This is only a partial list. It contains nothing concerning the other yards enumerated in a paragraph at the bottom of the list, and nothing about the tremendous activity in Norway, Sweden, France, Italy, Denmark and Holland, where, under various patents, and various designs, large cargo and passenger carrying ships of this type are being built. This list is as follows:

The Chairman. Well, Mr. Denman, I understood from your statement made on yesterday that there are a number of factories which are equipped in this country to build large Diesel engines at the present time.

Mr. Denman. There are now building, just commencing to build, Diesel engines of large marine type.

Partial List of Diesel-Driven Merchant-Motorships at Present Building in Great Britain

December 1, 1920

Number of Sister Motorships On Order	Deadweight Tonnage Per Ship	Horse-power (Indicated)	Name of Shipbuilder	Name of Engine Constructor	Name of Shipowner
4	14,000	6,600	Harland & Wolff, Glasgow	Harland & Wolff, Glasgow	Glen Line, London
6	10,000	3,200	Harland & Wolff, Glasgow	Harland & Wolff, Glasgow	Glen Line, London
1	14,000	6,600	Barclay, Curle & Co., Glasgow	Harland & Wolff, Glasgow	Elder Dempster Line, Liverpool
6	9,000	4,000	McMillan Shipyard, Dumbarton	Harland & Wolff, Glasgow	Lamport & Holt, London
3	9,190	3,200	Harland & Wolff, Glasgow	Harland & Wolff, Glasgow	Pacific Steam Nav. Co., Liverpool & London
3	11,500	4,500	Harland & Wolff, Glasgow	Harland & Wolff, Glasgow	Pacific Steam Nav. Co., Liverpool & London
3	2,000	450	Mercantile Dry Docks Co., England	Vickers-Petters Ltd., Ipswich	Arthur Tate & Co., Newcastle-on-Tyne
1	10,500	4,000	Wm. Doxford & Sons, Sunderland	Wm. Doxford & Sons, Sunderland	B. & J. Sutherland & Co., Newcastle-on-Tyne
3	10,500	4,000	Wm. Doxford & Sons, Sunderland	Wm. Doxford & Sons, Sunderland	Transatlantic Steamship Co. Gothenburg
1	4,000	1,350	Cammell-Laird & Co., Birkenhead	Cammell-Laird & Co., Birkenhead	Anchor-Brocklebank Line, Liverpool
1	5,500	2,750	Wm. Hamilton & Co., Port Glasgow	Cammell-Laird & Co., Birkenhead	Anchor-Brocklebank Line Liverpool
2	10,500	3,250	Vickers Ltd., Barrow-in-Furness	Vickers Ltd., Barrow-in-Furness	Anglo-American-Petroleum Co., London
4	10,500	3,250	Vickers Ltd., Barrow-in-Furness	Vickers Ltd., Barrow-in-Furness	Tankers Ltd., London
2	10,500	3,250	Vickers Ltd., Barrow-in-Furness	Vickers Ltd , Barrow-in-Furness	Un-named owners in England. Probably Tankers Ltd.
2	10,500	3,200	Harland & Wolff, Belfast	Harland & Wolff, Glasgow	Bibby Line, Liverpool
1	10,500	3,200	Harland & Wolff, Glasgow	Burmeister & Wain Copenhagen	Alfred Holt & Co., Liverpool
1	11,000	4,000	Alexander Stephen & Sons, Linthouse, Glasgow	Stephen-Sulzer	British Steam Nav. Co., London
2	10,500	4,600	Barclay, Curle & Co., Glasgow	North British Diesel Engine Co., Glasgow	British Steam Nav. Co., London
1	10,670	4,600	Robert Duncan & Co., Glasgow	North British Diesel Engine Co., Glasgow	British Steam Nav. Co., London
1	15,760	4,600	Wm. Denny & Sons Dumbarton	North British Diesel Engine Co., Glasgow	Union Steamship Co., of N. Z. Liverpool
2	1,200	600	Chas. Hill & Co., Bristol	North British Diesel Engine Co., Glasgow	British Steam Nav. Co., London
1	1,200	600	Wm. Denny & Bros., Dumbarton	North British Diesel Engine Co., Glasgow	British Steam Nav. Co., London
3	3,000	4,500	Workman, Clark & Co., Belfast	Harland & Wolff, Glasgow	Royal Mail Steam Packet Co., London
1	5,000	1,750	Existing Steamer Being Converted	North British Diesel Engine Co., Glasgow	Lane & McAndrew, London
1	10,000	3,000	Swan, Hunter & Wigham Richardson, Walker-on-Tyne	Swan, Hunger & Wigham Richardson, Newcastle-on-Tyne	Owners Unknown (England)
1	6,500	4,250	Sir. Wm. Armstrong Whitworth & Co., Newcastle-on-Tyne	Whitworth-Sulzer, Newcastle-on-Tyne	Spanish Owners
2	7,000	3,000	Ardrossan Shipbldg. & Dry Dock Co., Ardrossan	Hawthorne Leslie-Werkspoor, Newcastle-on-Tyne	Danish Owners
3	9,000	4,500	Ardrossan Shipbldg. & Dry Dock Co., Ardrossan	Burmeister & Wain, Copenhagen	Danish Owners
1	10,000	3,250	Wm. Denny & Bros., Dumbarton	Denny-Sulzer, Dumbarton	British Tankers Ltd., London
2	3,000	1,000	Wm. Beardmore & Sons, Dalmuir	Beardmore-Tosi, Glasgow	McAndrews Ltd., London
65 ships	583,600 tons d.w.c.	227,800 I. H. P.			

No information is available regarding Diesel-engines and motorships building by John Brown & Co., Clydebank; North Eastern Marine Engineering Co., Newcastle-on-Tyne; David Rowan & Co., Glasgow; Dunsmuir & Jackson, Ltd.; Fairfield Shipbuilding & Engineering Co., Govan; Glasgow; Wood & Skinner, Newcastle-on-Tyne; Clyde Shipbldg. & Engineering Co., Glasgow; Palmers Shipbldg. Co., Jarrow, England; and John Samuel White & Co., Cowes; including some motorships for the Cunard Line. In addition to the above the Anglo-Saxon Petroleum Co., of London (Royal Dutch Shell) have taken over about one-dozen motor tankers from the British Admiralty since the Armistice, including a Diesel vessel of 10,200 tons d.w.c. namely the "Marinula," ex. "Santa Margharita."

Attention is drawn to the fact that the above fleet of 65 British Motorships will together only use a total of 735 tons of oil-fuel per 24 hour day, compared with 2,165 tons per 24 hour day by 65 American Oil-Fired Steamers of similar aggregate D. W. tonnage and power—or a daily saving of 1,430 tons of valuable oil.

Furthermore, these British Motorships will be able to carry in aggregate at least 60,000 more tons per one-way voyage than the same number of American Oil-Fired Steamers of the same dimensions and power, and a total of 400 to 500 firemen are entirely dispensed with. This forcibly demonstrates the enormous economies effected by the use of motorships.

Reproduction of list of British motorships on order furnished to Congress by Mr. William Denman and referred to on the adjoining column. Among Diesel-vessels not included are two Werkspoor-engined vessels building by Wood & Skinner, of Newcastle. The three ships building by Workman, Clark & Co., for the R. M. S. P. Co., are 8,000 tonners.

The Chairman. For whom?

Mr. Denman. Private account.

The Chairman. Are there shipbuilding concerns that are building Diesel motorships of large tonnage in this country at the present time?

Mr. Denman. The Cramps have just began building for the American-Hawaiian Steamship Line, that great fleet of vessels that used to steam from San Francisco to Atlantic ports through the Canal and carried our bulk products by that route—they have just ordered two of the same type that I desired to have the Board adopt.

Mr. Schwab did not have this license; the Cramps had it. Mr. Schwab set about to develop a Diesel of his own, of an entirely different type, what is known as the two-cycle type, and had one vessel running with the new type of Diesel in it, the "Cubore," the vessel to which George Otis Smith, Director of the United States Geological Survey, referred to in the statement I read.

And there are a number of other plants in the United States capable of undertaking the conversion or the building of engines for new Diesel vessels. The trouble about doing the thing on private account is this: Nobody knows to what point the government is going to write down its steam fleet. Nobody knows what the policy of the government is going to be with regard to a merchant marine. Capital is hesitating to invest, fearing that a weak-handed policy may make any ships unprofitable, and also fearing that when the government writes down the values of its present fleet and begins to sell some of them at scrap prices, that the value of steamships will be utterly uncalculable, and therefore that ventures at this time are unwise. The government has got to at once, if we are going to have a balanced fleet of vessels, arrange for something like the same amount of Diesel tonnage that our competitors have.

The Chairman. We have 1,400 ships, a large portion of which at the present are tied up. Would you advocate the government, through the Emergency Fleet Corporation, building more ships with Diesel engines in them?

Mr. Denman. I think so, because you will not have any Diesels tied up. When the last steamship is tied up because it cannot run on the sea your Diesels will be running at a profit; and if it is a question of maintaining our supremacy on the seas and getting our share of the commerce of the world, we should have these ships. It may be the government can't afford it. It may be that it does not want to go ahead but will leave it to private capital.

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The Chairman. My question is, would you advocate the government, through the Emergency Fleet Corporation, building more ships, when it already has a large fleet of steam vessels, to the number of some 1,400, a large portion of which are tied up.

Mr. Denman. I have my doubts whether I want the government to act through the Shipping Board in any project. I want to see centralized control and not board operation in the matter of building ships. But I would say, in answer to your question, that if they cannot be gotten through any other agency of the government that the government should balance its fleet. If it is its intention to go ahead and manage the fleet that it has, it is foolish to go into competition with our opponents and not have the weapons for the contest.

The Chairman. How do you explain the fact that no American concern has undertaken, with the possible exception of the American-Hawaiian Steamship Company, to have constructed Diesel motorships?

Mr. Denman. In the first place private capital has been loath to enter into the shipping business in competition with the government. It does not know where it is going to land. Very few new ships have been purchased, but the fact is that there is strong inquiry as to where they can be built and a strong demand for Diesel motorships.

The Government of Norway took three 20-year-old hulls and equipped them with Diesels of this type that Lord Pirrie is using in the Harland and Wolff yards. As I have said, the hulls are 20 years old, and the Diesels were Burmeister and Wain Diesels, and those vessels were sold to New York owners six months ago at $240 a deadweight ton—even though the hulls were, as I have said, 20 years old—as against $175 to $180 a ton for new steel turbine steamships. You can therefore see what the demand is for them if they can get them.

The Chairman. But if there is such a great advantage in this type of ship, if they will be carrying freight when the last steam-propelled vessel is tied up, why should private operators or steamship companies hesitate on account of the United States Government's fleet about constructing these ships and going ahead and operating them?

Mr. Denman. Because, first there is general hesitation about expanding in the steamship business with the government's policy unsettled. Second, inability to get the engines if they wanted them for quick delivery, with uncertainty as to future forces on the sea. Now, if we had had built in 1917 a large group of these Diesel factories, then these Americans could have gone to them and gotten their engines, and the government would not now be faced by the problem of a semi-obsolete type of vessel, and bantering the question as to whether private or government ownership should operate them.

As a matter of fact what happened during the war was that these Diesel plants built some engines. If you talk about converting steam plants to Diesel-engine plants, the Diesel plants built steam engines, and of all the topsy turvies I have ever heard of that was the most extraordinary.

The Chairman. Did you ever bring this to the attention of Mr. Schwab when he was acting as Mr. Hurley s assistant?

Mr. Denman. No; I did not. I assumed that the recommendations as to type came from the operating end.

The Chairman. Well now, have you any knowledge, Mr. Denman, as to whether or not the Fleet Corporation or the Shipping Board did actually have constructed some Diesel engines which, upon a try-out proved to be failures?

Mr. Denman. I do not know whether they proved to be failures or not, Mr. Chairman. But they were not of the type of the Danish East Asiatic Fleet and those that these other great fleets were using. They were smaller than were necessary for a 10,000-ton type of ship.

The Chairman. You let contracts for a great many ships of less tonnage than that?

Mr. Denman. Oh, yes.

The Chairman. And could not Diesel engines have been put in smaller types as well as in 10,000-ton ships?

Mr. Denman. Yes, sir; and be very valuable in certain services.

The Chairman. Do you know whether or not they actually did have Diesel engines for smaller ships which, upon try-out were pronounced to be failures?

Mr. Denman. I do not know whether they were pronounced to be failures or not. I understand that those small engines that were ordered by the Shipping Board, of a type that at that time was not developed, and not such as the Burmeister and Wain and the Werkspoor type, were not completed for the Shipping Board, and I am told were completed for other persons and successfully completed and that the vessels had good engines.

The Chairman. They have what?

Mr. Denman. That the engines are good engines.

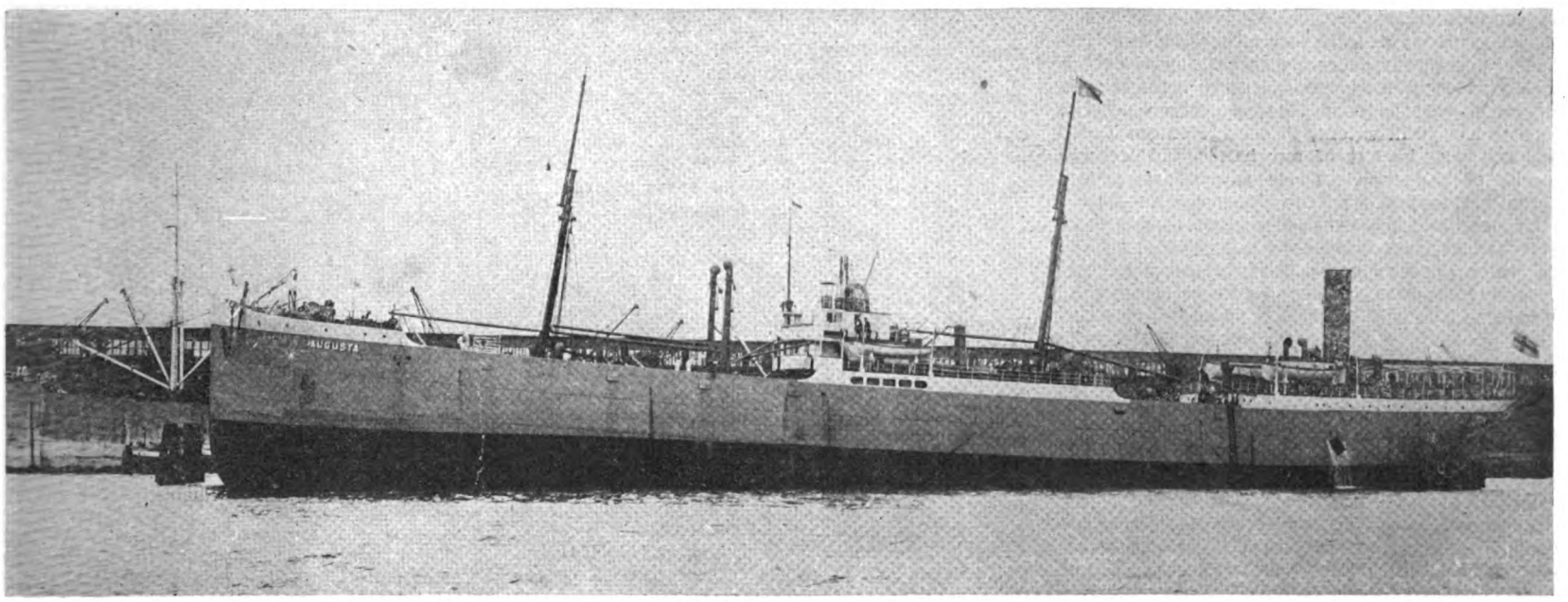
[Both the Skandia-Werkspoor and McIntosh & Seymour Diesel engines ordered by the Board made a 30 days full-load non-stop run on the test-bed, and can be regarded as eminently successful. —*Editor, "Motorship."*]

The Chairman. If I get your recommendation correctly as read from your statement which you made, it is that the government should either go into the building of motor-propelled ships or assist private concerns in having a fleet of motorships built and developed.

Mr. Denman. That is, if the government is going to adopt a vigorous policy for the purpose of entering into overseas competition. If it is going to have a lax hand, if we are going to drift along as we did, controlled by British and German propaganda, for years in this country, affecting every ship measure that we desired to have put through by the Congress; if the policy is going to be to drift along, then I answer no. But if we are going to get into the game and drive it through, yes.

The Chairman. In event that the government is going to pursue a vigorous policy in behalf of the merchant marine, what is to become of this fleet of steam vessels; that is, if we are going to embark in constructing a motorship fleet or going to assist in the development of a motorship fleet.

Mr. Denman. Exactly what will become of the steam vessels of our opponents. The vast mass of fleets of the world are steam. They are gradually introducing the motorship as the modern type of propulsion. We want to keep pace with them. These vessels will be used, gradually becoming obsolescent and will go on the cheaper runs and the shorter runs, where saving of fuel does not mean so much. We must keep pace at least with our competitors in the type of ship that they are using. We are more in need of it than they are, because, as I have said, we are a high-wage country, and the Diesel engine cuts out a certain number of operators in the engine-room. We are a bulk-carrying country, and we want space and large space on our ships. We are an oil-producing country and have the oil for ships. We are a long-voyage country, across the Pacific and the Atlantic, and the long-voyage savings are the savings in fuel consumption.



The 5,000 tons motorship "Augusta," ex-"Zamora," built by Palmers & Jarrow, England, in 1891, and converted to Diesel power in 1919 with a gain of nearly 700 tons net cargo-capacity and a reduction of fuel-consumption from 20 tons of coal down to 4 tons of oil per day. The engine-room staff was reduced from 13 to 8 men. She is now owned by Bror M. Banck, of Stockholm, and is propelled by a four-cylinder 800 shaft h.p. two-cycle type Sulzer-Diesel engine. The same owner has three other Sulzer-Diesel engined ships under construction and conversion, totalling 24,000 tons d.w.c. and 6,600 i.h.p. Mr. Bror M. Banck recently emphasized his belief in motorships in the course of a personal interview with our Scandinavia correspondent.

The Chairman. Isn't it a fact that practically all of the commerce brought to our ports today in competition with our own fleet arrives in steam-propelled vessels?

Mr. Denman. That is quite true, because the bulk of the fleets of the world are still of steam, but the fact is——

The Chairman (interposing). There are 21 of these vessels floating around somewhere.

Mr. Denman. Oh, there are over a hundred of them.

The Chairman. How is it that none of them get to the United States?

Mr. Denman. Why, Mr. Chairman, I thought I described on yesterday the voyages those vessels take. They are sailing in and out under my window over the Golden Gate constantly, and unless California is out of the United States they are coming to a port in this country and carrying cargoes to and from that port. The fact is that the Pacific coast is so far from you in the east that the Pacific coast conditions are not known to our Atlantic coast men, just as I wanted somebody on the Atlantic coast to be the chairman of

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the Shipping Board for the reason that I did not feel I was acquainted with the Atlantic coast conditions. The United Fruit Company has been using Diesels; the Atlantic Transport Company is using them; the Hamburg-American line has been using them. The Hamburg-American line, at the time the war came on, had orders out for a very large fleet of them.

[Practically every week foreign motorships arrive at Atlantic Coast ports—sometimes several in a day.—*Editor, "Motorship."*]

The Chairman. Do you know whether or not experiments are in process in this country for the development of an American type of this Diesel engine?

Mr. Denman. About a year ago it was announced that we were going into some experiments on what was known as the Diesel electric drive. Now, the electric drive has been very successful on our war ships; and where huge engine powers are involved, 100,000 h.p. for instance, as against 3,000 or 4,000 h.p., used on the freighters, you can see where the value of the electric drive would come in. On the naval ships there is economy and facility of operation gained by taking those enormous powers and transmitting them through electricity to the shaft rather than by trying to put the enormous power directly on the shaft by mere physical action. That is a great gain. Now, it has been suggested that the same thing might be true in transmitting the power from the low-powered Diesels to the shaft. It is an experiment; I hope it succeeds. But, Mr. Chairman, there is no Diesel-electric drive ship running, and I understand no Diesel-electric drive ship under construction.

Now, gentlemen of the committee, by the time you have got your experiments developed, two or three years will have gone by; the commerce of the world will be established on other people's ships to a certain extent, to a large extent I will add, and will be out of our hands and we will be out of the race. These things are proved things. It is just like the Babcock and Wilcox boiler, or the triple-expansion engine, or any of the types that were advanced in the 90's and 80's and which are now going into obsolescence. The Diesel engine in 1917 was a proved commercial success, and those 21 ships, a photograph of which I left here prove it; as the other 100 now in existence demonstrate it every day.

When people come to you and tell you the Diesel is an experimental matter I ask you that you show them these 21 ships and ask them if they have read the reports of trips that are given to the Danish East Asiatic Company, which reports they give out and are glad to give out. Ask if they have seen them, and have noted the tremendous saving and economies in operation annually. The Danish East Asiatic Company is one of the most prosperous shipowning companies in the world and has been since the beginning of the use of these motorships.

The Chairman. Cannot you understand that the new administration coming into the Shipping Board upon your retirement, finding contracts having been awarded for hundreds of ships, with ships under construction already requisitioned, with ships in the fleets on the high seas commandeered, with arrangements having been made for the cessation of bridge building and of building operations generally except where absolutely necessary, with the steel supply practically diverted toward shipbuilding operations, with all the engine builders of the country arranged with for the construction of steam engines, that they would naturally hesitate about departing from that program and entering upon a new line of engine construction using a different fuel.

Mr. Denman. After I came to Washington in the January following and reminded Mr. Hurley of our discussion on the previous July and August, that he had forgotten that there was a contract offered and wondered whether it was in the files and sent down and got it. Now, I have no doubt—and I am not criticizing the good faith of those gentlemen. The last thing in the world I want to do is to criticize Mr. Hurley's good faith. When we had up the fight on the Cunard ships he was with us. Hurley has been right, but he didn't know anything about shipping. All he had done on Diesels is to turn out journalistic articles praising them—I call them journalistic ersatz and not real ships.

The Chairman. He had not signed the contract in January?

Mr. Denman. No. I was told by some members of the Board afterwards that they got the contract and discussed it at that time, and I understood that the thing was dropped in the general mess that arose out of shipping accounting and other difficulties.

Mr. Kelley. Are there any operating depots that might have been avoided by more attention to the operating end.

Mr. Denman. Yes; if they had compared their operation of Diesel ships with their operation of steam vessels I would not be here talking to you about Diesels.

Mr. Kelley. The Diesel ships are very expensive to operate, aren't they?

Mr. Denman. They operate at one-third the fuel cost of steam vessels.

Mr. Kelley. The upkeep is very high, isn't it?

Mr. Denman. No; it is much less, or at least not more than in the case of steam vessels.

Mr. Kelley. What about the initial cost of Diesels?

Mr. Denman. When you take the cargo-carrying capacity of a ship into consideration it is about the same per ton carriage; per ton actually carried it is about the same. That is the real question. If by paying a little more for your engines you do not have to push so much fuel around and you carry more cargo, that is the test. It is volume of cargo carrying capacity or ton mile per annum that determines the value of the results.

Wednesday, Dec. 15, 1920.

Mr. Denman. Coming back to the subject of motorships and the composition of foreign propaganda against them: You will recall that Great Britain was a coal-burning nation prior to the great war and did not possess any great oil fields. British shipping has always been closely coordinated to British raw materials. The Burmeister and Wain Diesel patents were, however, being used in the Harland and Wolff yards prior to the war, and during the war they produced a number of these large Diesel ships.

In my testimony on yesterday it appeared that the British Diesel plants were turned on submarine construction. The Harland and Wolff plant—in which Lord Pirie has the interest I have spoken of—however, continued to build large-size Diesel motor cargo and passenger ships during the war; and since that time, with the Mesopotamian oil fields in sight and now apparently in hand, has come an enormous stimulation of internal-combustion oil-engines in Great Britain, producing the activities shown in the partial list of ships which I gave to you yesterday, and which I trust will appear in the record.

The long voyages of the Danes and Swedes and Norwegians are like ours in America. That, as I say, developed the Diesel long prior to this, and I now will read a short excerpt from "a very voluminous writer" on shipping matters which you will find pertinent.

The Chairman. I know that we might find a whole library full of documents pertinent on the matter, but we cannot continually fill up our record with excerpts, it seems to me, from various documents. We are asking for your views. You have expressed them pretty fully, and submitted documents, which are in the record here; and, besides, the matter to which this is directed is more a legislative proposition, which should properly go to another committee of the House.

Mr. Denman. I quite agree with you that I should not go on and on and on, but this happens to be Mr. Hurley, and it happens to show what Mr. Hurley recommends, and also shows what he knew in August, 1917.

Mr. Steel. Is that an excerpt from his book "The New Merchant Marine"?

Mr. Denman. It is. I want to show that the vessels that are his type are vessels of 1912 and 1913. It is very short—

"Close in the wake of this first bold venture came the 'Selandia,' engine by Burmeister and Wain, in 1911." The "Selandia" is the first vessel in that group of pictures that I handed to you the day before yesterday.

"This vessel is a 7,400 deadweight tons cargoship, driven by twin-screws, each shaft being fitted with an 8-cylinder 4-cycle directly reversible marine Diesel motor of 950 brake h.p. The vessel had been engaged in long voyages, between Europe and the Indies, in the service of the East Asiatic Company, and her performance has been so highly satisfactory that several hundred seagoing motorships that have followed her in the service have been designed and engined in substantially the same way. There has been a tendency to larger and more cylinders, but almost every improvement in the marine Diesel has been in mechanical betterment of parts. An excellent and very full idea of the comparative economies of the steam-engine using coal-fuel and the Diesel-motor using any of its wide range of oil-fuels, may be had from the following extracts taken from the engineer's log book and to vessels in the employ of the same company engaged in making the same voyage."

Then follows a description of the vessels and the items of engine performance. Now, this is a typical vessel, which is the basis of Mr. Hurley's conviction that we must go to the building of motorships; it exactly fits the "Siam"—410 feet long, 55 feet wide, 30 feet deep, deadweight carrying capacity 9,500 tons, and speed 11.14 knots. The "Siam' was the vessel that sailed into San Francisco in 1913, and the "Siam" followed the model of the "Selandia" and the hundreds of vessels Mr. Hurley describes. Already had a very large number of them been built when I turned the project over to him.

Now, Mr. Kelley, you asked me on yesterday whether or not the contract from the Cramps group was examined by Mr. Hurley in January, 1918, if that contract at that time would have been of any value to him.

Mr. Connally. I would like to ask you a question with reference to the Hurley quotation which you say was from his book. When was the book published?

Mr. Denman. Recently.

Mr. Connally. Why did you make the statement that the quotation would show what Mr. Hurley thought about the subject in 1917?

Mr. Denman. Because I told him this.

Mr. Connally. But your telling him that does not appear there from the quotation from the book.

Mr. Denman. No; but I am showing the identity of my statements in 1917 with Mr. Hurley's statement in 1920.

Mr. Connally. Do you think it hardly fair to say that you are quoting from a book, which was published in 1920, which would show what Mr. Hurley knew in 1917?

Mr. Denman. If I gave that impression I am sorry.

Mr. Connally. I think you gave it, and I think the stenographer's notes will show that way.

Mr. Denman. If I gave it that way I am glad you called my attention to it. The fact is that this statement is my statement in 1917 in form.

Mr. Connally. But it is not shown in the book or written form?

Mr. Denman. What is here stated in Mr. Hurley's book in 1920 is a reproduction of our discussion in 1917. Mr. Walsh, yesterday you were asking me about the contract proposed with the Cramps group, and our discussion at luncheon, Mr. Hurley and myself, early in 1918, of the Cramps contract. At that time he could not have availed himself of it because when the contract was not taken up by our successors the Navy came in and took up practically all the constructive capacity or activity of the Cramps plant.

The Chairman. For Diesels?

Mr. Denman. It was Navy construction. I cannot tell you about Diesels. I think it was for steam, and that the De la Vergne Diesel plant was not, as I understand it, acquired by the Cramp Shipbuilding people, although I may be mistaken about that. The point is that the licenses of the Cramps were not utilized early in 1918, nor were they utilized after the armistice, nor were any of the hundreds of steel contracts for cargo ships—for hulls I am speaking of now—let for the Diesel form nor for any of these other large Diesel plants that could have manufactured under the Cramp license or the Werkspoor license, or any other license utilized for making commercial Diesel-engines, but instead some of them were converted into the manufacture of steam-engines.

Mr. Kelley on yesterday asked me whether or not the operations of the Diesel engine in commercial-carrying ships was a more or a less expensive operation than a steam-vessel burning oil

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under the boilers in the form of propulsion, and I gave him my opinion. I have here the opinion of about 25 of the more important shipping men of the world, English and American and Scandinavian on this subject, which answers that question.

The Chairman. How authentic are those?

Mr. Denman. They appear in this technical journal "Motorship," and I imagine will not be questioned. They include Admiral Lord Fisher and the whole group of men who have been for years prognosticating, and many of them manufacturing Diesels. Sir Marcus Samuel, who is engaged very largely today and has been during and since the war in the manufacture of Diesels in England, makes a statement concerning their economies. [We presume Mr. Denman refers to Sir Marcus Samuel's connection with the North British Diesel Engine Work. We omit the list of statements made regarding the Diesel motorships, as the same already have been published in "Motorship," as indicated by Mr. Denman—*Editor.*]

Mr. Denman. You were asking me whether there has been any place in which this project in our time had been laid down as a matter of policy, and I am now quoting from the records of the Shipping Board:

> "Minutes of a special meeting, Wednesday, July 19, 1917. The Chairman. (Mr. Denman). I desire to say, General,* as to the proposals of the Cramp people as to the construction of Diesels, that that is the beginning of a great project, a project which involves the use of the Diesel motor ultimately as a substitute for steam. I happen to be familiar, and have been for some time as attorney for a company operating a fleet of Diesels between Scandinavia and California, with some of the details of their use and their value, and know some of the possibilities of their development." * * *
>
> "In view of the fact that it is not a simple contract but the beginning of a great project, I desired to have the Shipping Board present so that they could sit and consult with the various persons engaged in the project, get information and put questions, so that if they have any suggestions floating out of their experience and minds which is not entirely negligible they could, after consultation with you, work out the project in full.'
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> "The Chairman. (Mr. Denman). We may also want to discuss the question whether or not the contract with these gentlemen for the development of the thing should be along the lines of government ownership of the license, or government ownership of the Diesel plant, itself, just as you are going to make this fabricating ship plant."

Mr. Denman (continuing). After I retired from the Board——

Mr. Foster (interposing). May I ask right there, how soon did you retire after the day on which that meeting was held?

Mr. Denman. On the 24th.

Mr. Foster. This was on what day?

Mr. Denman. The 19th. After I retired from the Board I prepared a statement, which was read into the record of the Senate, as follows:

"The Shipping Board had other constructive policies, both to meet war need and for the upbuilding of our mercantile marine, which it was framing, always acting under the pressure of the consciousness of the submarine menace and always under the necessity of creating a new branch of its organization as its functions were increased. Included in these policies was the following:

"(5) The inauguration of the building of a Diesel motor-driven fleet of merchant-ships of the Norwegian "George Washington" type, which, with the great saving in fuel and cargo space, wide sailing-radius, and reduced labor cost, would free us from bunker control of other nations and give us a dominance in maritime carriage after the war."

Mr. Denman. I was asked yesterday about motorships being constructed in this country. There are today 11 motorships, aggregating 120 odd thousand tons, being built in America; and they, of course, are the beginning of many more to follow. Mr. Schwab is building 4 of about 20,000 tons deadweight capacity.

Mr. Steele. Each one?

Mr. Denman. Yes; each one. That shows how the powers have developed since the 10,000 ships in my time and in Mr. Hurley's time. The 10,000 ton ships was what was regarded in a way as the unit of tramp cargo carriers. Two are being built for the American-Hawaiian Steamship Company by the Cramps. Those I think are 12,000 tonners. One is being built for the Alaska Steamship Company, but I have not got the size of that. Two are being built for the Standard Oil Company of California. One is being built for the Submarine Boat Corporation. In this connection I want to speak of the attitude of certain oil companies towards the Diesel motorships——

Mr. Connally (interposing). Mr. Chairman, I want to object right here, and ask how far is the committee going to pursue the Diesel proposition?

The Chairman. It seems to me that those matters are subsequent to the administration of Mr. Denman and his successors. I do not quite see the pertinency, except the fact, which appears, that they are building Diesel ships now. I do not know that we care anything more about that. This whole Diesel proposition, or a goodly portion of it, Mr. Denman, as you have testified about it before the committee, of course, is not strictly within the jurisdiction of this committee. You have explained very fully, and gone into the matter very fully. You have brought out the fact that this proposition was under consideration at the time you resigned, and that a contract was practically to be signed and was not signed, and that it was feasible, according to your view; and I understand that Diesels ships are being built at this time.

Mr. Denman. That is in pursuance of the question put to me on yesterday.

Mr. Chairman. I do not think we ought to pursue the subject beyond the point that you have I think very fully developed; namely, that this matter was under consideration by you as chairman of the Board; that the most of the details had been arranged; that a contract had been practically prepared and was being taken up with a view to signing it, and was handed down by you to the subsequent administration, but nothing was done by them.

The Chairman. Have you any questions, Mr. Steele?

Mr. Steele. Just a few. After your connection with the Board ended did you remain in Washington?

Mr. Denman. I was here for about three weeks. I wrote a letter to Mr. Hurley advising him that I desired to lay before him these projects.

Mr. Steele. That is, the Diesel projects?

Mr. Steele. Yesterday you placed in the record a list of the ships being constructed in Great Britain of the Diesel type.

Mr. Denman. Yes.

Mr. Steele. Were they constructed under government or private management?

Mr. Denman. I think nearly all of those were under the—those now being constructed are under private management, but during the war all shipping in Great Britain, as it was in the United States, was under government control. Lord Pirrie, who is constructing them, was British Comptroller of Ship building.

Mr. Steele. That list is made up of ships under private management?

Mr. Denman. Yes, sir.

Mr. Steele. You also referred to having obtained a license with reference to the Diesel engine.

Mr. Denman. I obtained it in this sense, that I got the Cramps to make a tender of the license that they already had, in connnection with the contract.

Mr. Steele. The Diesel engine had been patented, had it not?

Mr. Denman. Well, there are a great many patents. The original patent of Dr. Diesel had expired, but the idea had been appropriated to many forms of propulsion, and this particular one, that was chosen by Lord Pirrie, who was the master of English shipping during the war and was had by the Cramps, was the one I chose.

Mr. Steele. Has that been patented in this country?

Mr. Denman. I presume it has but I do not know.

Mr. Steele. It was from the Cramps that you obtained this license that you speak of?

Mr. Denman. I obtained it in the sense that I got the Cramps to offer to build it.

MR. DENMAN AND ENGLAND

In our interview by a reporter of the "New York American" Mr. Wm. Denman, first chairman of the U. S. Shipping Board, following his preliminary statement before the Walsh Committee, said:

"I am not anti-English. I am for an American merchant marine that will not be governed by a British-controlled Atlantic Conference.

"While we were neutrals I vigorously opposed British discrimination, but I am an Englishman by descent, am in sympathy with Liberal England, and reverence English law, which I taught in the University of California for a number of years.

"I believe in 'hands across the sea' between American and English liberals, though I want to grasp the hand of an English Liberal and not a British foreign office representative.

"Commercial competition with Great Britain in sea carriage is now one of the vital economic internationl issues facing the country."

LORD PIRRIE AND MOTORSHIPS

In an interview with a representative of the New York "Journal of Commerce" prior to sailing on the "Olympic" Lord Pirrie stated that he considered speedy passenger-liners, which demand fast dispatch, were the only type of ship which should be equipped with oil-fired boilers. Lord Pirrie stated with emphasis that he did not think that tramp steamers should be fitted with oil-burning installation. Regarding motorships Lord Pirrie expressed the opinion that this class of ship had a great future and that he believed they would be developed into the most economically propelled vessel on the seas.

LORD PIRRIE AND THE OIL SITUATION

Regarding the remarks made by Lord Pirrie in a letter published in the December issue of "Motorship," the following comments culled from "Fairplay" (one of the leading British shipping journals) are of interest:

With oil scarce and dear the "dope" now appears to be that the only economical way in which to burn oil is—not under boilers, but in internal-combustion engines. There is, of course, no doubt about it; Mr. Churchill said so in 1912 when he described oil-burning for steam raising as the half-way house to internal-combustion. Lord Pirrie is not very hopeful of immediate relief from the oil-engine. The progress towards perfection of the Diesel engine will, he thinks, be very slow, and, moreover, if the conversions of cargo steamers to oil-burning continue, owners of motorships may find themselves without fuel for their engines. Considering the success of Lord Pirrie's own Burmeister and Wain Diesel, I think the eminent shipbuilder's pessimism about the progress of the internal combustion engine is excessive. It is not in any degree doubtful that the expensively stimulated demand of cargo steamers for oil fuel is seriously involving the position of steam liners and motorships. Still, if price is the ultimate determining factor—and I have a suspicion that it will be—the motorship and the liner will be able to pay it and the oil-burning cargo steamer will not.

RICHARD AIREY AND LORD PIRRIE'S WARNING

In the correspondence columns of our December issue a letter from Lord Pirrie dealing with the oil situation was published. Commenting on Lord Pirrie's remarks at the recent meeting of the American Petroleum Association, Mr. Richard Airey (Vice-President, Roxana Petroleum Corp. of the Royal Dutch-Shell Group) said:

"A significant statement was given out by Lord Pirrie the other evening before leaving for Mexico. He sounded a note of warning that the supply of oil-fuel was not unlimited and it behooved shipowners to proceed with great care and consideration before definitely adopting an exclusive oil-burning fleet. I do not altogether share in this view of the matter as the use of liquid-fuel is so admirably suited for marine purposes and has so many advantages over coal that if ever a serious shortage should take place, then its use for land installations must be curtailed in order to provide ample supplies for the ships of the world.

*General Geo. Goethals.

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Orient S.S. Co.'s First Big Diesel-Ship

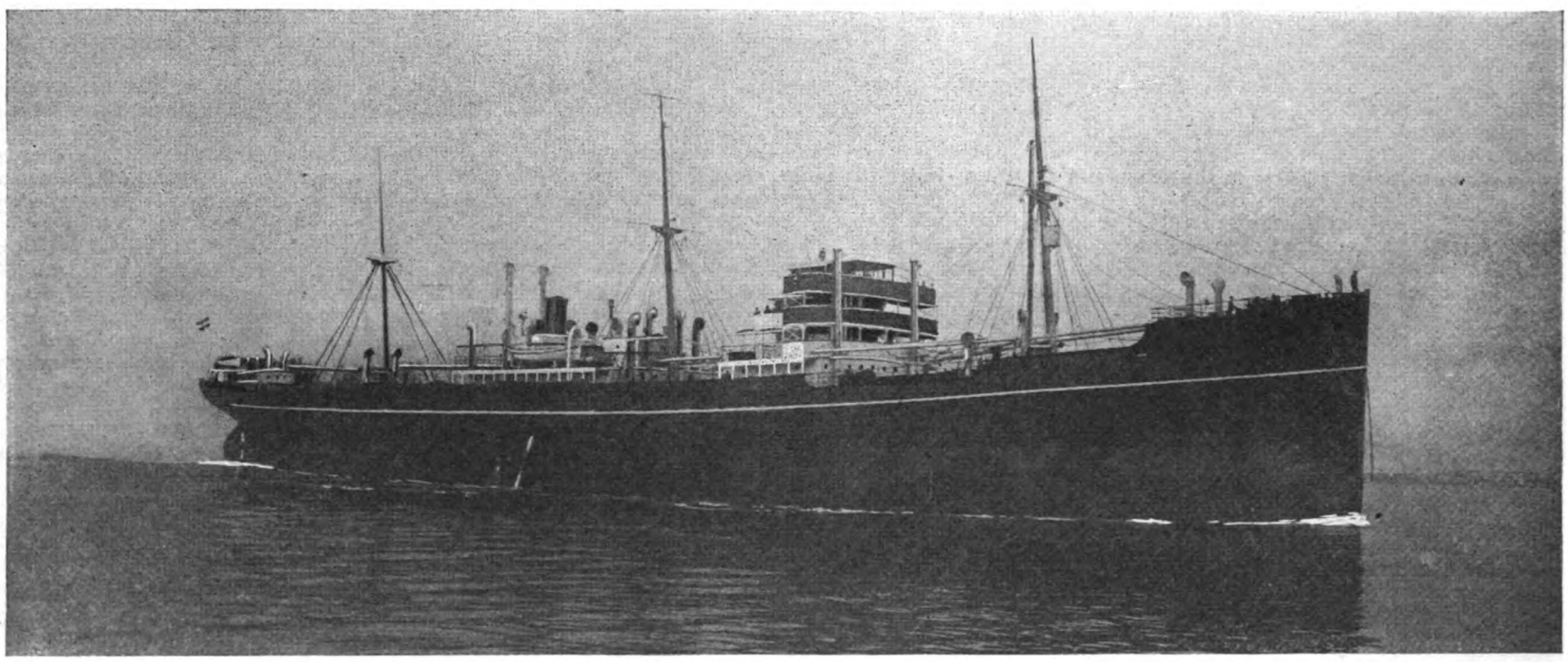
Trials of a Naskov-Built Burmeister & Wain Motorship

AT the end of October last trials took place of the first large Diesel motorship built for the Orient Steamship Company of Copenhagen. It may be remembered that the Orient S.S. Co. was formed for the purpose of purchasing the steamships that were placed on sale by the East Asiatic Company when they decided to abandon that type of vessel in favor of Diesel propulsion exclusively. That the Orient S.S. Co. are now actively taking up motorships is of considerable importance and should be borne in mind by American steamship operators.

The first motorship has been named "Indien" and has been built at the Nakskov Shipyard, while the Diesel-engine construction and installation work were carried out by Burmeister & Wain—the main engines consisting of two 1550 i.h.p. four-cycle type Diesel engines at 125 R.P.M., giving the vessel a fully-loaded speed of 11½ knots. She is of the awning-deck class built to Lloyds 1A+.

Dead-weight capacity	8,750 tons
Power	3,100 i.h.p.
Length between perpendiculars	390 ft.
Breadth Moulded	53 ft.
Depth	36 ft. 6 in.
Mean-draught, loaded	26 ft. 11 in.
Capacity of fuel in the bottom tanks	1,100 tons
Speed (loaded)	11½ knots
Trial speed	12.51 knots

On the trial trip the speed maintained over the measured mile was 12.51 knots, the two engines together developed 3,230 h.p. at 136.75 revolutions per minute. In every respect the trials were satisfactory and the vessel left Copenhagen the following morning for her maiden voyage to the Far East. Owing to there being a dense fog while trials were taking place, the illustration of this ship which we give is not very good, and it has been necessary to slightly retouch the same. Diesel-electric auxiliaries are fitted throughout, including winches, windlass, steering-engine and wireless telegraphy. Her owners, the Orient S.S. Co., are very closely associated with the well-known East Asiatic Co. It is interesting to note that the builders of the "Indien," namely, the Nakskov Yard, also constructed the Diesel-engined tanker "Mexico," which we illustrate in this issue.



The Orient Steamship Co's new 8,700 tons d.w.c. new motorship "Indien." A fog prevailed during trials. She was engined by Burmeister & Wain.

Two American Diesel Engine Papers

Interesting Lectures by Mr. G. C. Davison and Lieutenant-Commander H. Gibson

AT a recent meeting of the Motorboat Section of the Society of Automotive Engineers Lieut. Comm. H. Gibson of the U. S. Navy Department presented some interesting data on German submarine Diesel engines, and Mr. G. C. Davison, Vice-President of the New London Ship & Engine Company, gave a most interesting lecture dealing with commercial motorboats and Diesel engines.

In the course of Lieut. Comm. Gibson's remarks on German submarine Diesel engines he stated that among those which he inspected personally, there were a hundred and eighty-three in all, he found the following makes:

M. A. N.*
Blohm & Voss
Deutz
Koerting Bros.
Krupp.

Only five of these were of the two-cycle type and these were all out of the repair. He stated that at the beginning of the war the enormous influence of the Krupp concern forced the adoption of their two-cycle machines, but their unsatisfactory performance brought it about that towards the end it was no longer manufactured and Krupp's themselves had to build four-cycle engines. The type which was found to predominate was the M. A. N. [Augsburg design—*Editor*] four-cycle machine which was built on a standardized and interchangeable plan by M. A. N., Krupp, Blohm & Voss, and Köerting Bros. Capacities, speeds and some of the weights are given in the following table:

B. H. P.	R. P. M.	Complete with Dependent Auxiliaries Weight in Lbs.
100*	550	.....
300	500	.....
500†	500	.....
1,200†	450	57,000
1,750†	380	97,000
3,000†	380	144,000

*Air starting clutch reverse.
†Oil-cooled pistons double fuel-valve.

All these engines except the three-thousand horse-power model were built of steel castings with cast-iron cylinder-liners and cast-iron pistons. The illustration he gave showed clearly what the method of construction is; we are told that this was adhered to fairly closely in all the sizes from the smallest to the largest. The only important parts of the engines that did not seem to be standardized was the air-compressor, which in some sizes was built four-stage and in others three-stage. The same arrangement as regards position on the engine, however, was maintained throughout; the compressor with fuel-pumps, hand-priming pumps, over-speed governor, and all controlled-gear was placed at the forward end of the engine.

Of the sizes given the 1,200 H.P. seems to have been built in so much greater numbers than the others, that it may be called the standard size used by the Imperial German Navy.

Lieutenant-Commander Gibson brought-out in considerable detail the refinement and excellence of the German constructions. Fundamental in them is the extraordinary use of steel-castings which were cast with sections so thin that they are a marvel to foundry men and engineers of other countries. Sections as thin as one-eighth of an inch were found to have been passed perfectly and it is impossible to escape the conclusion that the Germans were able to cast-steel in the same way that we cast brass. An interesting refinement found on the 3,000 H. P. engine was the use of a separate piston-crown made of steel. It was so perfect and completely free from flaws of any kind that it is a mystery to this day whether the part was cast or forged.

The steel piston-head is flanged to the cast-iron trunk body of the piston and is provided on its under surface with machine labyrinth grooves so disposed as to constrain the cooling-oil to flow in a tortuous path from the periphery to the center and then out. These grooves were closed off by a diaphragm held in place by studs turned out of square bar-stock fitting in square holes in the diaphragm and provided with castellated lock-nuts. Outside of riveting it is impossible to imagine any type of fastening more secure than this against coming loose because of vibration.

The same mystery as regards the nature of the steel used is encountered when the piston-pin boxes are examined. There is no doubt that these boxes are made of steel (lined with a thin layer of babbitt) but no analyses have yet revealed whether they were forged or cast. The lower halves of the boxes considerably over-hang the eye of the connecting-rod and thereby provide so large a bearing-surface that no trouble has ever developed because of the heating of these parts.

* Maschinenfabrik Augsburg-Nürnberg A. G.

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An interesting feature of the crank-shaft is that the extreme after journal next to the fly-wheel is considerably larger in diameter than the remaining journal. On the ten-cylinder 3,000 H. P. engine, the enlarged journal is 12⅜" in diameter whereas the regular journals are only 11 7/32" thick. The stroke and bore of this engine is 21" by 21" respectively.

The cylinder-head fastening on all the engines is accomplished in a unique manner by the use of studs in the water-jackets which project so little that they do not begin to reach above the tops of the cylinder-heads. The nuts for them are tubular with a mushroom-head and a square-hole at the upper end. The mushroom or shoulder fits into a counter sink of the cylinder-head surface and thereby becomes practically flushed with it. This feature greatly improves the appearance of the engine and has a great practical use in increasing accessibility on top of the head and permitting greater freedom and neatness in the location of valve-cage flanges, pipes and the remainmaining cylinder-head fittings.

These four-cycle M. A. M. (Augsburg) engines are by no means a war product. One ship that was found in regular service had a 1,200 H. P. engine of this make on board which was dated 1912. The displacement tonnage of the ship was 800 on the surface and the combination of this size of ship with the 1,200 H.P. engine seems to have been the standard submarine used by the Germans. It may be remembered that very complete technical details and illustrations of the 3,000 B.H.P. appeared in "Motorship" of January, 1920, these being the first details ever published.

* * * *

In the paper entitled "Commercial Motorboats and the Diesel Engine," by Mr. G. C. Davison the application of oil-engines to small boats was interestingly discussed. The three types of prime-mover compared were the gasoline engine, the surface-ignition or hot-bulbs engine, and the Diesel engine. Charts based on assumed first costs of the different types and on estimated fuel-consumptions were shown and indicated that in installation where the yearly operating time is less than 250 hours the gasoline-engine still has a considerable field; but as soon as greater numbers of working hours and larger powers are reached the hot-bulb and the Diesel engines show marked economies.

As regards cost of operation in sizes of about 100 H. P. there is no very pronounced difference between the hot-bulb and the Diesel engine; but, Mr. Davison showed that there are other considerations which point to the Diesel engine as the more desirable type of prime-mover. Owing to the fact that practically all the hot-bulb machines operate on the two-stroke cycle with crank-case compression, the consumption of lubricating-oils, he said, is high because of the leakage into the crank-case of oil from the main-bearings. In sizes below 100 H.P. the Diesel engine is at a disadvantage because of its high first-cost, a consideration which, however, is offset to some extent by the ability of the Diesel engine to burn cheaper grades of fuel. Mr. Davison's paper stated that cost of attendance is so nearly the same for all the engines of the sizes considered that it does not enter into the comparison.

The question of direct or mechanical reverse was carefully considered and it was shown that below about 300 H.P. a clutch can be built which is not too cumbersome and which gives a degree of flexibility not easily obtainable in the direct-reversing systems which make use of compressed air.

A rich field for commercial application of oil-engines of smaller power was shown by Mr. Davison to exist in the Northern Fishing Banks. Some excellent fishing banks are not entirely inaccessible to steam-driven trawlers because of their inability to carry sufficient fuel for the round trip and it was stated that in some cases larger steam-boats than were necessary had been built merely to be able to carry enough coal for the moderately distant fishing-banks.

A further promising application for oil-engines can be made in the case of fire-boats, particularly if used in conjunction with electric drive. The unsurpassed flexibility and certainty of control inherent in this system is added to the advantage of being able to drive the fire-pumps electrically with the full power of the ship. The complete absence of standby losses is the governing consideration.

As regards electric-drive in general the interesting point was made that in the applications of this system to vessels used for towing the prime movers can be run at their full-power and normal-speed while the propeller-speed is electrically geared-down to a figure most advantageous for the towing requirements.

Oil-Fired Steam-Engine Obsolete

Burning Oil Under Boilers Is Waste Without Excuse or Justification

By M. L. REQUA*
(Vice-President Sinclair Consolidated Oil Corp.)

WE are beginning to realize that we cannot with impunity draw indefinitely and wastefully upon our natural resources; we cannot shut our eyes to the evolution that is continuous from generation to generation, or as individuals burn the candle at both ends, without sooner or later being confronted with a day of reckoning.

Burned under boilers, fuel-oil is at best wastefully consumed, and at worst is losing in every barrel 20% to 30% of lubricating stocks that we shall some day need, and need badly. Over any long period of time its future use in this manner is without excuse or justification. I am not attempting to convert the world from the burning of fuel-oil under boilers to the Diesel-type of engine off hand. It cannot be done; but the oil industry should recognize that there is a forward step that in my judgment is inevitable and must be taken because of economic conditions, if no other. Employed in the Diesel-type of engine that same barrel of oil is used at a saving of 75%. I seriously question whether the marine steam-engine burning fuel-oil is not today as a matter of fact, an obsolete piece of machinery.

There are over 140,000 gross tons of Diesel-type equipped shipping now under construction in the United States, and a large foreign fleet is in operation and building. A recent report of Lloyds indicates that 1.7% of the world's tonnage is already converted to the Diesel-type of marine-engine. I have been very much interested in a discussion with Mr. Grace, of the Bethlehem Steel Co., who has built two identical ships, with the exception that one is equipped for burning fuel-oil and the other is burning Diesel-oil. Those two engines are running in the ore trade between the United States and Cuba in parallel with each other, and as a result of those operations up to date he tells me that in his mind there is no question but that the problem has been solved.

Mr. Robert Moore, of the Moore & Scott Iron Works, of San Francisco, builders of ships, recently passed through New York and I saw him, and I said: "What in the world are you doing here?" He said: "I am on my way to Europe to study the Diesel-type of engine, that is the coming engine, and is going to supersede all types of steam-engines." I made a mental reservation, and it was this: "Provided they get the fuel." It is the part of the oil industry to provide that fuel. You have an obligation resting on you that you cannot get away from.

* Before American Petroleum Institute, Washington, D. C.

FOUR 12,000-TON DIESEL-DRIVEN TANKERS TO BE BUILT ON THE PACIFIC COAST

According to our Scandinavian correspondent, the Norway-Pacific Construction & Dry Dock Co. of Everett, Washington, has received an order for four 12,000 tons tank-ships at a contract price of $210.00 per ton, and these vessels are to be delivered during 1921-1922, and that there are prospects from the same owners for a further order of nine large tankers covering this company's shipbuilding activities from three to four years.

Owing to Diesel engines not being able to be supplied in time, the first two vessels will be given steam-machinery, but remaining vessels will have Diesel engines. The shipyard in question has just been reconstructed—having originally been a yard in which a large amount of Norwegian capital was invested. It is now being amalgamated with a newly formed company known as the International Charters Corporation, with Lord Cecil A. Greenfell as president of the board of directors.

This company has acquired the oil-transport rights from Mexico and the United States to Europe for ten years, and the capital is American, English, Mexican and Norwegian. In return for a cargo of cellulose for use in tube construction in the oil-fields of Mexico, Norway will receive a tanker load of oil.

In addition to these six tankers the Norway-Pacific Construction & Dry Dock Co. will erect five oil-fuel bunker-stations, of 30,000 bbls. capacity each, in Puget Sound, Columbia River, Monterey Bay, San Diego and Panama, costing half-a-million dollars apiece. On each of these the Norway-Pacific Co. has a profit of 20% guaranteed.

GENERAL ELECTRIC CO. OF GERMANY BUILDING 24 LARGE MARINE DIESELS

Now under construction at the works of the Allgemeinen Elektricitats-Gesellschaft (General Electric Company) Berlin, Germany, (generally known as the A. E. G.) are 20 merchant-marine type Burmeister & Wain Diesel engines each of 1,550 indicated h.p. and four engines of the same design but of 2,250 indicated h.p. These are building to the order of the Deutsche Werft A. V. of Hamburg, and the hulls of a fleet of cargo-vessels to take these engines are being constructed by the Deutsche Werft (German Shipyard) at Hamburg. The first pair of these engines recently completed very successful trials and have gone to the shipyard for installation.

It is interesting to note that the A. E. G. are licensees of the Deutsche Werft A. G. who in turn are closely connected with the Deutsche Oelmaschinen-Gesellschaft of Hamburg. The latter concern are the sole concessionaries for the B. & W. license in Germany and Italy, and kindly furnished us with this information.

FROM TURBINE STEAMER TO DIESEL MOTORSHIP CONSTRUCTION

Four More Scandinavian Shipyards Change Plans

The Odense Shipyard, Denmark, is a fairly recently erected plant, and was laid-down for the purpose of constructing Vickers type turbine-driven steamships. This company is diverting their attention from this class of work, and is now engaged in the construction of two large steel motorships for Fred Olsen, of Christiania, in which twin-screw Burmeister & Wain Diesel engines are to be installed.

Furthermore, the new Baltica Shipyard at Copenhagen, which was originally laid-out to construct turbine-driven steamships, is now at work building two 6,000 tons motorships for a Copenhagen ship-owning company, the Diesel engines of which also will be furnished by Burmeister & Wain.

Thirdly, the Oresundsvarvet, of Landskrona, have turned from the building of De Laval turbine-engined steamers and are constructing two large motorships for Lan Brostrom interests. One of these vessels is of 10,400 tons d.w.c. and 4,000 i.h.p., while the other is of 4,450 tons d.w.c. and of 1,600 i.hip., They are illustrated on page 44 of this issue.

The fourth shipyard which turned from the construction of steamers to Diesel motor vessels is the Nakskov Shipyard, who built the East Asiatic Company's motor-tanker "Mexico" and the Orient Steamship Company's 8,750 tons d.w.c. motor-freighter "Indien." These vessels are also illustrated in this issue.

DODGE HEAVY-OIL ENGINES

We have received an interesting pocket catalogue dealing with the Dodge marine and stationary heavy-oil engine from the Dodge Sales & Engineering Co. of Mishawaka, Ind. A copy of this booklet can be obtained by writing to this firm.

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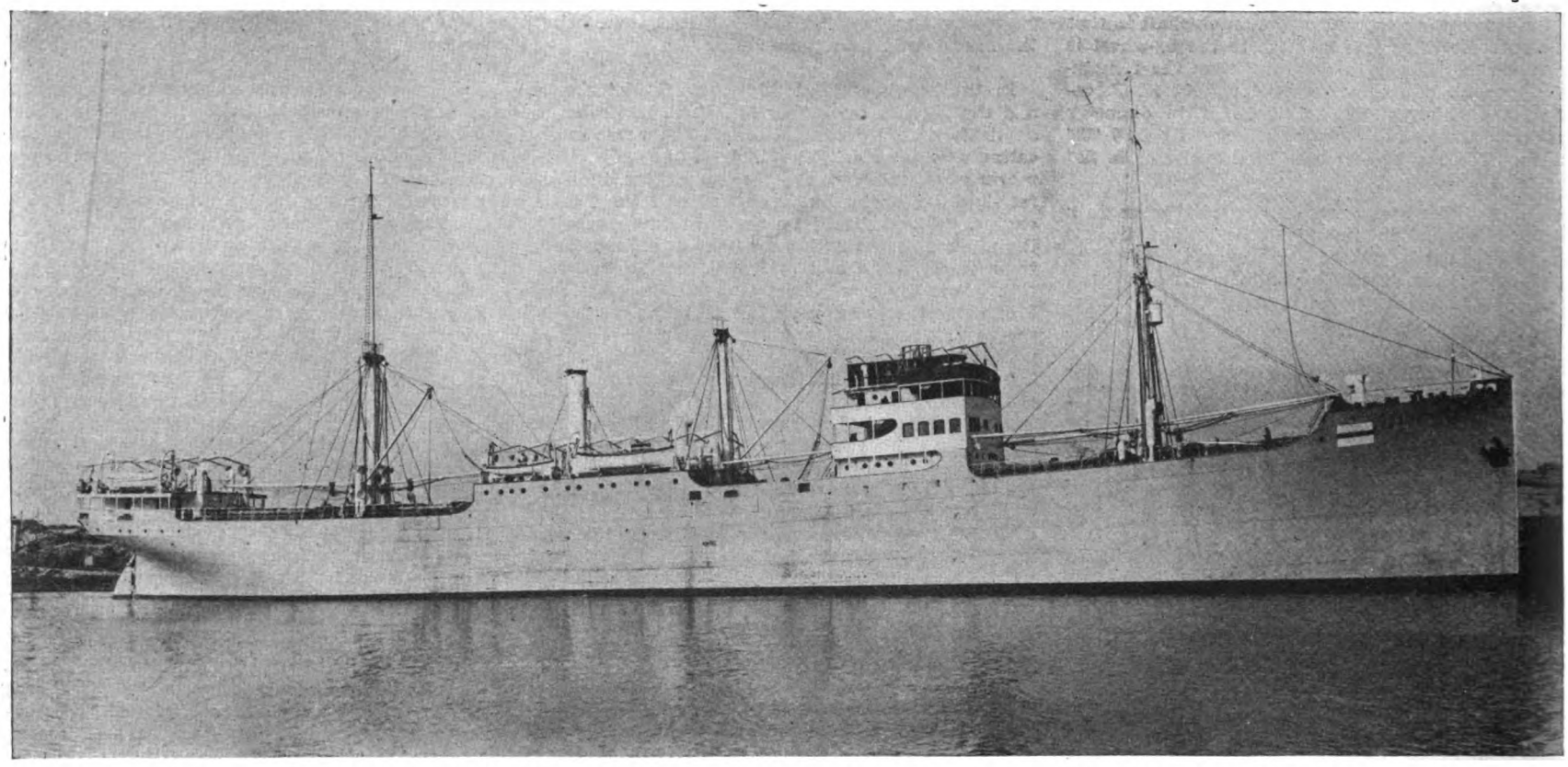


The new Werkspoor Diesel-engined freighter "Tosca," 6,990 tons d.w.c., owned by Winge & Co. of Christiania. Two 1,100 shaft h.p. engines are installed. Loaded speed, 11 knots. Two sister motorships, the "Indra" and "Geisha," are nearly completed.

"Tosca," "Geisha" and "Indra"

Three Large Sister Cargo-Passenger Motorships with Werkspoor Diesel-Engines

By S. SNUYFF

DURING the entire period that this country was in the war and for many months after the Armistice, construction on large motorships on order in Holland for Norwegian owners was practically suspended through lack of materials. Lately, however, work has been actively resumed on such craft, and the past few months has seen the launching and trial trips of quite a little fleet of Werkspoor Diesel-engined merchant vessels, several of which already have been illustrated or described in the pages of "Motorship," and others are pictured in this issue.

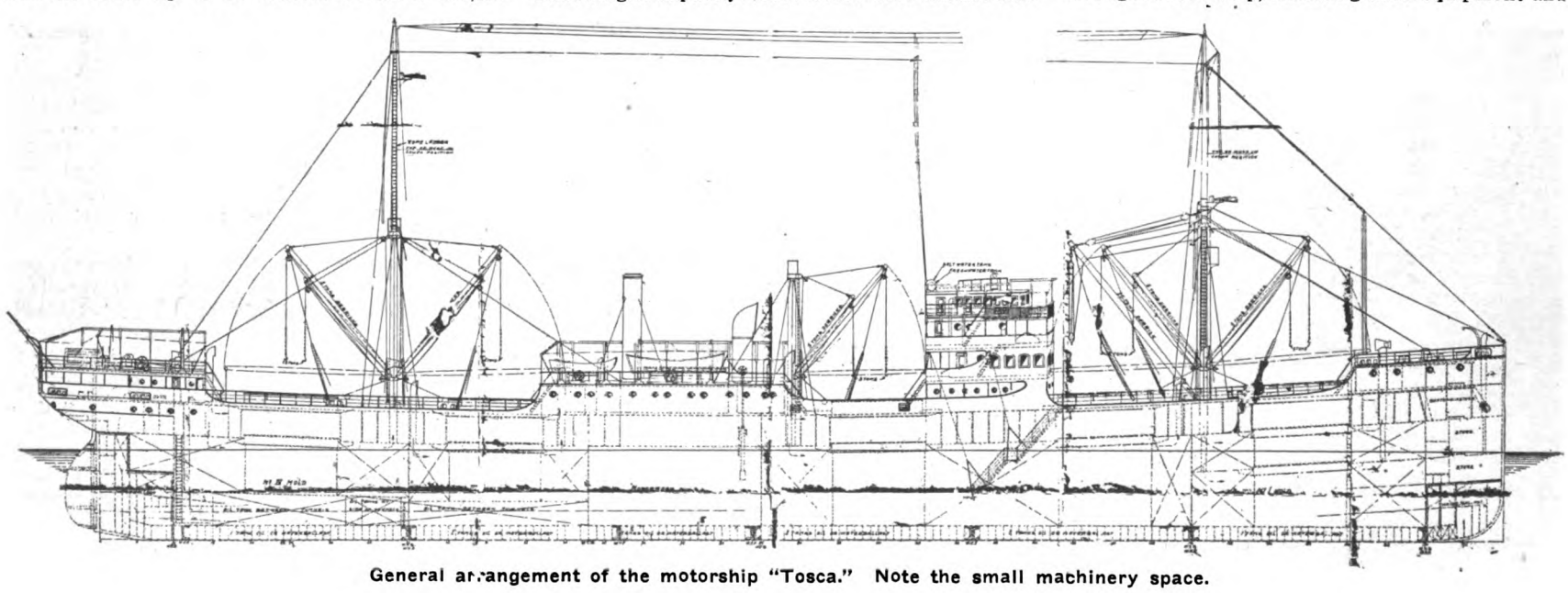
Among trials recently run were that of the new twin-screw motor-freighter "Tosca," one of three sister craft of 6,990 metric-tons d.w.c. each building to the order of Winge & Co. of Christiania, Norway, all of which have Werkspoor Diesel-engines. There also is a single-screw motorship of 6,000 tons displacement and of 2,140 i.h.p. building for the same owners to be Werkspoor powered. We believe she is to be named "Aida." The other two motorships have been named "Geisha" and "Indra." This makes a fleet of four Diesel craft aggregating about 25,000 tons d.w.c., 35,100 tons displacement and 10,540 i.h.p. for this enterprising Norwegian firm, and brings the total of Werkspoor-engined mercantile ships in service and on order up to 44 vessels of about 197,225 tons displacement and 65,615 indicated horsepower excluding ships and engines constructed by Werkspoor licensees in England, France and America. The grand total is 49 merchant-motorships of about 228,000 tons displacement and 73,500 horsepower, according to available lists, making Werkspoor second in the world to Burmeister & Wain, with Sulzers, McIntosh & Seymour and Vickers tying for close third. For naval Diesel engines, Sulzers, Vickers and Augsburg probably lead in number and power.

The "Tosca" was built by the Nederlandsche Scheepsbouw Maatschappiji (Netherlands Shipbuilding Co.) of Amsterdam, and engined by Werkspoor of the same city, the two plants being on adjoining property, and originally were one concern. At one time Peter the Great of Russia worked in this shipyard.

The principal dimensions of the "Tosca" are as follows:

Displacement (loaded)	10,260 metric-tons
Deadweight capacity	6990 metric-tons
Fuel capacity	218 tons
Capacity of ballast tanks	1,088 tons
Length (o.a.)	391 ft.
Length (b.p.)	375 ft.
Breadth	51 ft., 3 in.
Depth to main deck	25 ft., 6 in.
Depth to upper deck	34 ft.
Mean draught	23 ft. 1 in.
Gross tonnage	5,128.49 tons
Net tonnage	3,129.10 tons
Engine-power	2,200 shaft h.p. (3,000 i.h.p.)
Diameter of cylinders	22.047 in.
Piston-stroke	43.307 in.
Engine-speed	125 revs. per min.
Propellers	11 ft. 9¾ dia. by 10 ft. 2 in. pitch and 3.6m. proj'd area
Ship's speed (loaded to 25 ft., 1 in.)	11 knots
Daily fuel-consumption	10 tons
Register	Norwegian Veritas

The two Werkspoor 1,500 i.h.p. propelling Diesel-engines are of the four-cycle type and are installed approximately amidships. In addition there are three Werkspoor four-cycle type Diesel two-cylinder engines of moderate power, each coupled to a 50 k.w., 220-volt at 250 r.p.m. generator set, furnishing current for the auxiliary machinery throughout the ship, including deck equipment and



General arrangement of the motorship "Tosca." Note the small machinery space.

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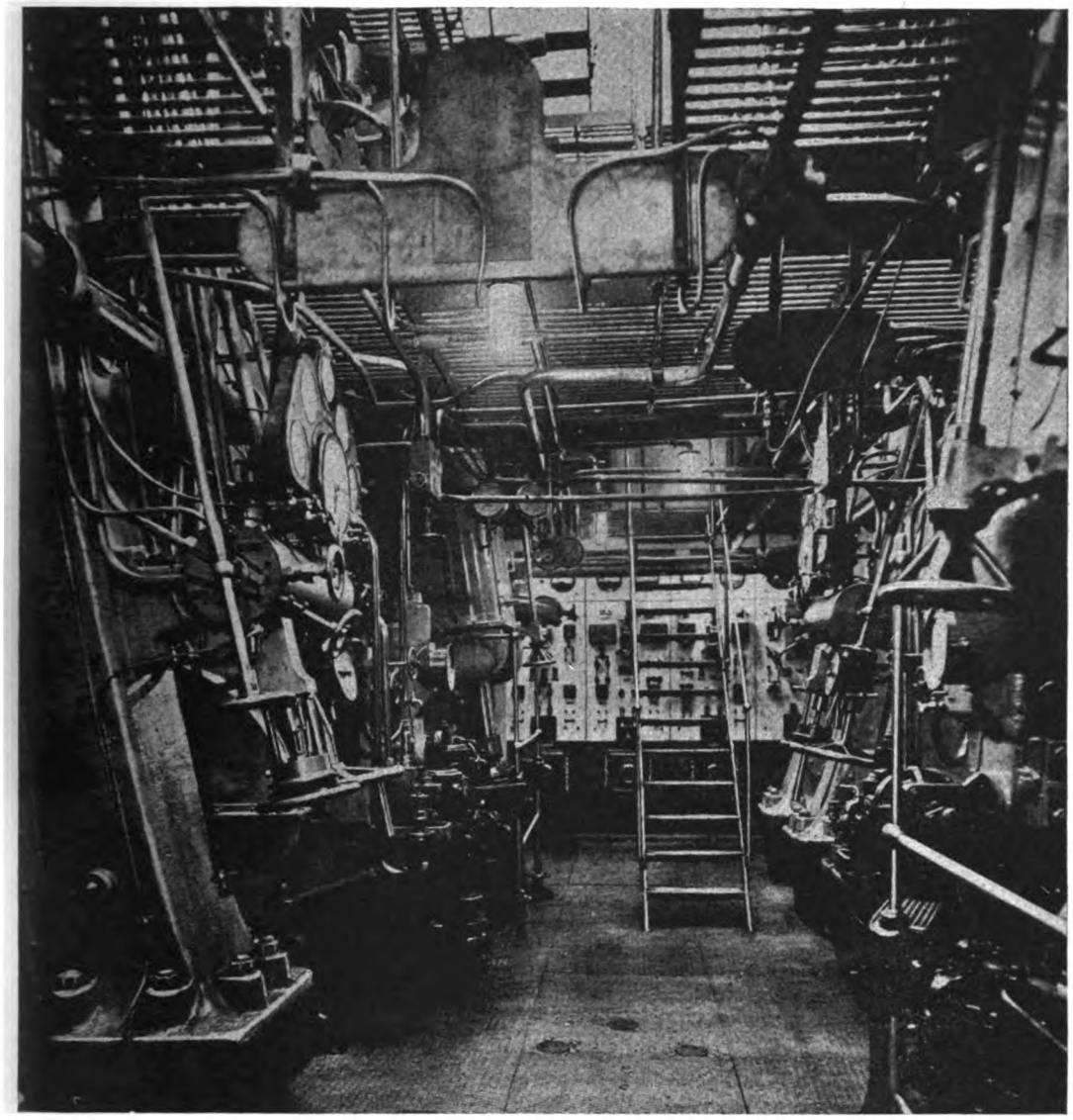
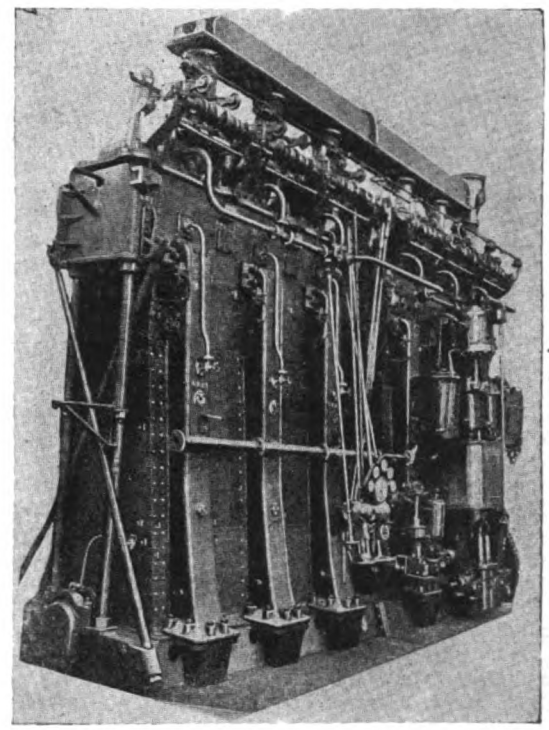


M.S. "Tosca." The engine-room looking between the two Werkspoor main Diesel-engines towards the electric control-board.

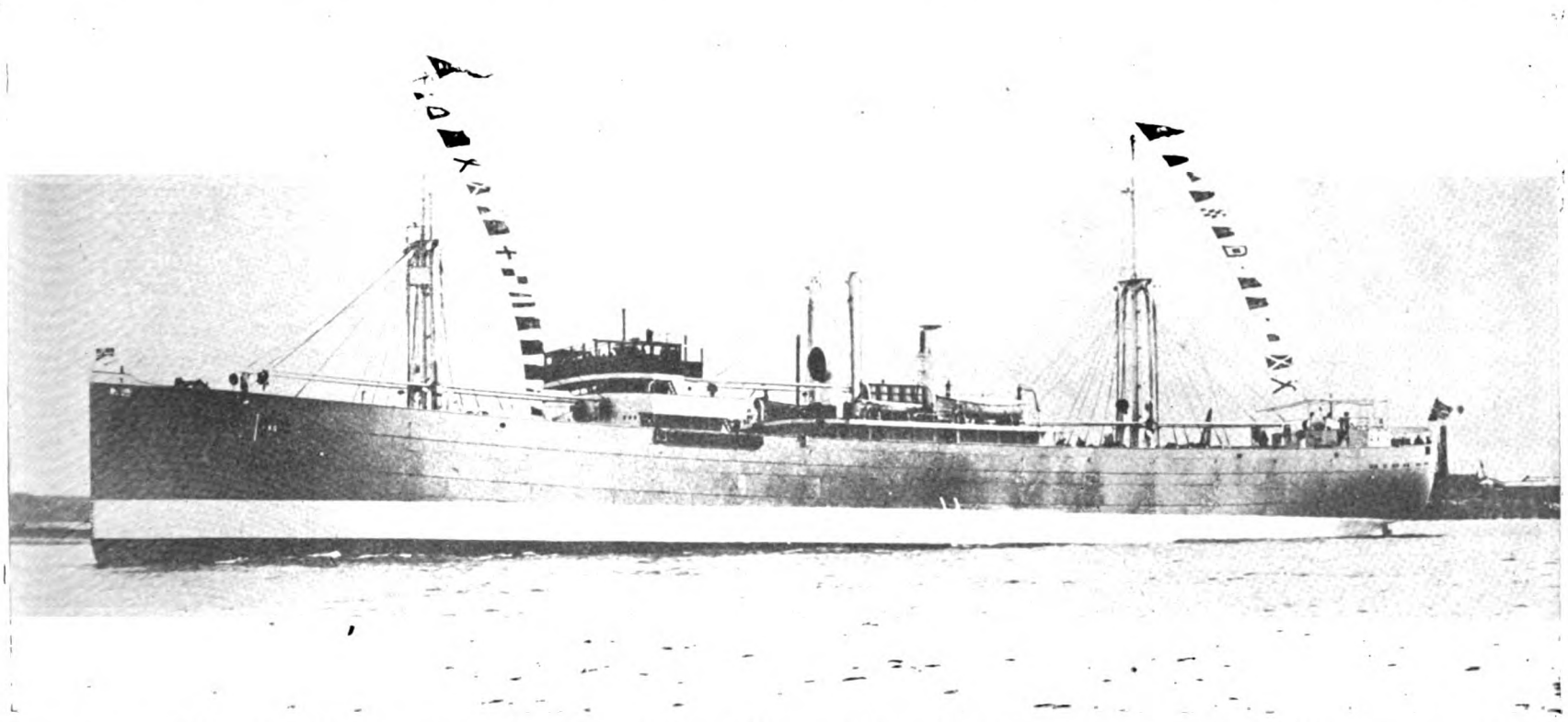
the electric-lighting. There also is a single-cylinder Kromhout surface-ignition oil-engine direct connected to a dynamo for the purpose of emergency electric-lighting. It develops 7½ b.h.p. at 550 r.p.m.

A very interesting innovation is the mounting on the outside of the hull of the ship a water-tight electric-plug contact which is connected with the ship's main circuit. This allows the vessel to receive—if desired—current from the municipal or port electric-system when in harbor, and this saves fuel, labor and engine-wear and tear, whenever the "Tosca" is in port where such electric-current is available. We doubt, however, if any economy will be gained. In harbors where no suitable current is available, the auxiliary Diesel engines and generators will be used. Possibly there is something to be said for this system, because there is no necessity to use it if not required; but, on the other hand, it enables the engineers to go ashore, when a brief stay is being made in port.

Another novel installation which is a combination of engineering skill with culinary ingeniousness, Werkspoor realized that the temperature of the exhaust-gases from the main engines is just correct for cooking, baking, boiling, frying, roasting, stewing, etc., and so developed a cooking-range in part of the exhaust-manifold of the main Diesel engines. It consists of a plate-chest inserted in the manifold which can be closed by doors, but the front side is swept by the exhaust-gases on five sides externally. It is a very simple device, but is so effective that no ships' cook could desire anything better. It has the advantages economizing in coal expense and saving the space where coal or oil would have to be carried. On the other hand, it has a disadvantage, that it could only be used when the vessel is at sea, as



M.S. "Tosca." .Back view of one of the Werkspoor Diesel engines, showing both cast-iron and steel columns.



The new 9,700 tons displacement motorship "Athene," built for K. Salvesen (Ada S.S. Co.) of Kragerö, Norway, and just placed in service. She is propelled by twin 1,400 i.h.p. Werkspoor Diesel-engines.

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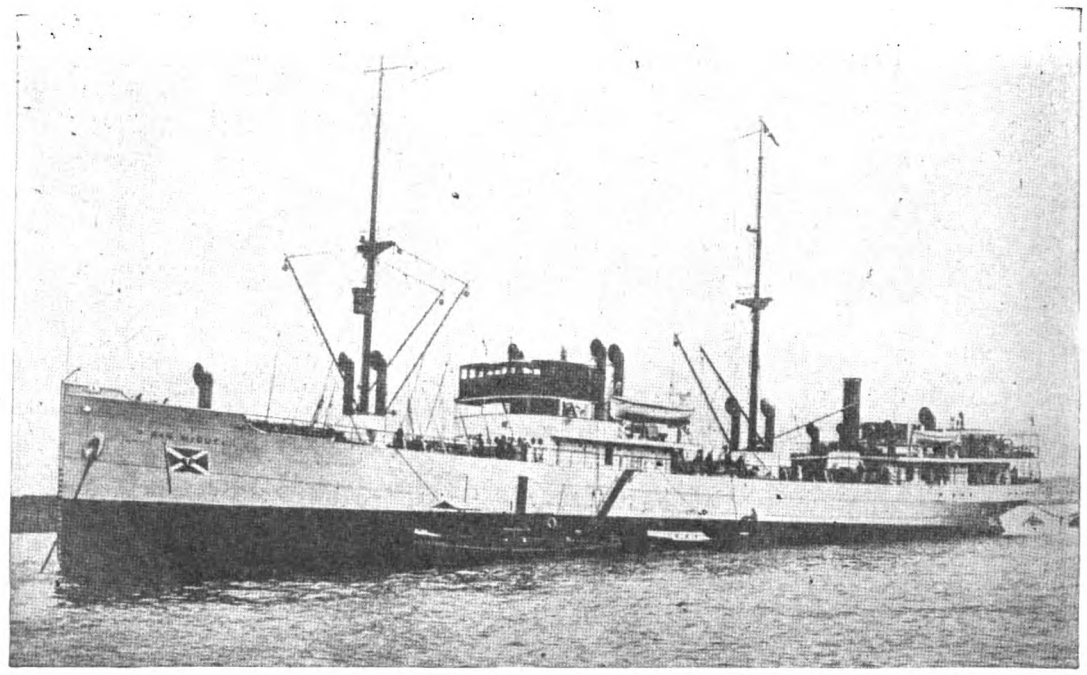
when in port the main engines are stopped. Consequently, when the vessel is in harbor another stove is used for cooking, and this is fired by a small oil-fired burner in conjunction with compressed-air from the storage bottles in the engine-room.

On the trials of the "Tosca," which took place in November last in the North Sea, the ship and all her machinery gave complete satisfaction and a speed of 11 knots was easily attained. Of special attention to those aboard was a change to the reversing mechanism, which has resulted in a decided improvement so far as control of the engine is concerned. It may be remembered that the engines of the motorship "Salerno," described in our issue of November, 1919, and June, 1920, were fitted with the first design of a new reversing mechanism of the diagonal-eccentric system with a single camshaft.

This is retained with the engines of the "Tosca," but instead of control levers operating this mechanism the levers for changing over from starting-air to fuel are substituted by a single hand-wheel. Consequently, the whole manipulation of starting on three cylinders by air and three cylinders on fuel and then the entire six cylinders on fuel is accomplished by a continuous turning movement of this control-wheel, a scale being marked on the wheel showing the exact position of the starting mechanism.

It should be recorded that the two propelling Diesel engines were never run in the works after construction, but were installed in the vessel, run under light load for some six hours, then run with the vessel tied up for four hours, after which the ship proceeded on her sea trial and was then handed over to the owners ready for any ocean passage.

Regarding the deck machinery, there are four electrical-driven winches forward, two electric winches amidships and four more aft. These motors and winches were built by the Electrotechnische Industrie voorheen Willem Smit of Slikkerveer, Holland, but the winches and all the other electrical machinery on board this ship was constructed by Figge & Co. of Haarlem, with the exception of the small emergency dynamo already referred to.



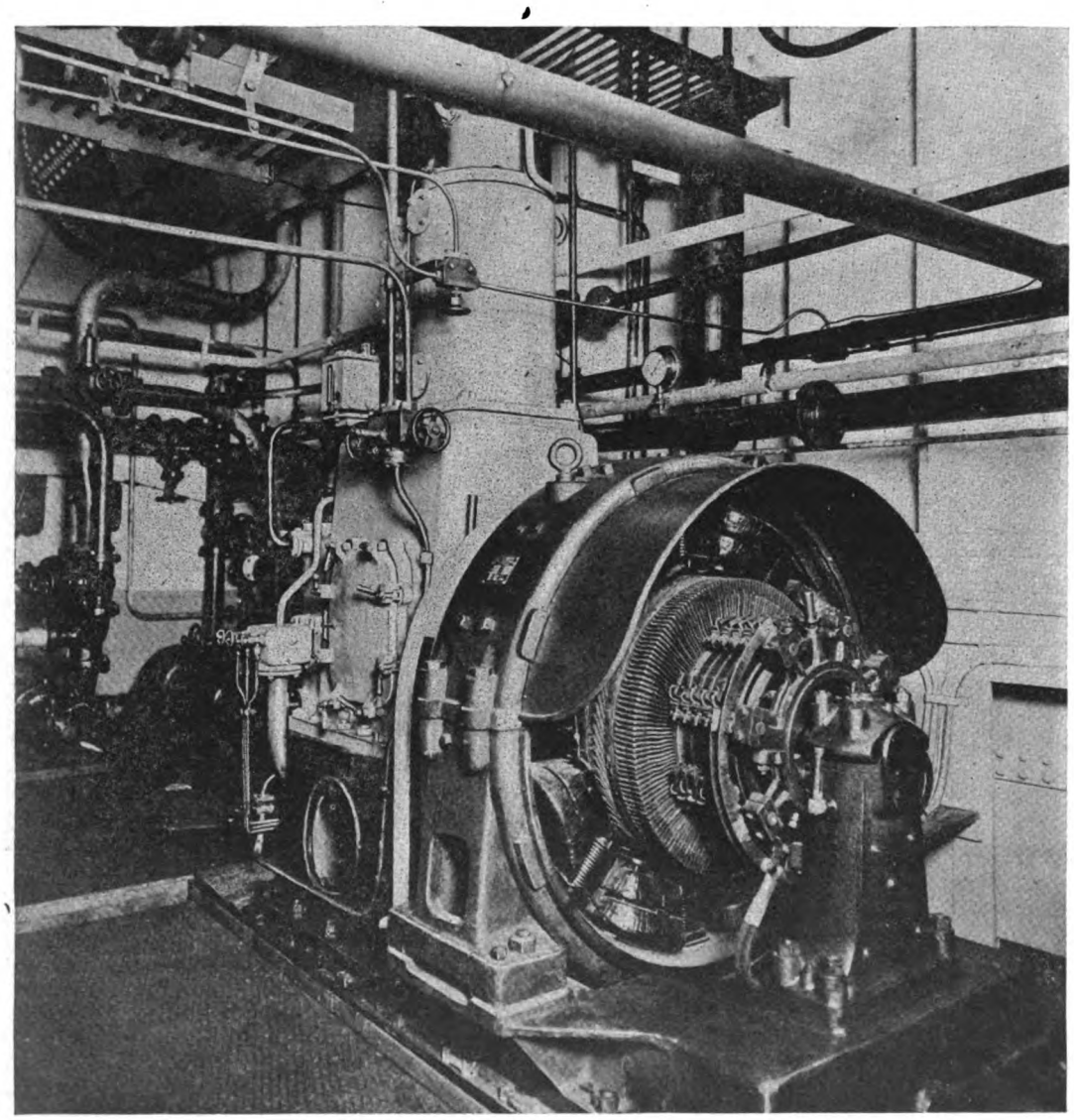
"San Miguel," another new Werkspoor-engined single-screw Diesel motorship of 1,400 i.h.p. and of 4,050 tons displacement, owned by Otto Thoresen, Christiania, Norway.

A new windlass is in a sheltered position on an open forecastle and operates by means of bevel-gears and vertical-shafts connected to two capstans on the forecastle deck. This may be regarded as a decided improvement on the arrangement of the anchor windlass on board the motorship "Athene," where it stands unprotected, the capstans being direct coupled to horizontal shafts. This machinery is equipped with an electric motor of 50 h.p. and has a well-designed slip-coupling in the work-wheel. The Hele Shaw-Martineau steering gear is electric-motor driven, and has a Mactaggart, Scott & Co. telemotor.

There are eight cargo-derricks each with a lifting power of 3 tons. In addition there are two derricks with 5 tons lifting capacity, and a larger one with a lifting capacity of 25 tons. The four holds have steel bulkheads amidships, which can be lengthened by means of wooden bulkheads, so a continuous bulkhead amidships is formed. The hull and machinery have been built to the rules of the Norwegian Bureau Veritas and the Norwegian Law, and the bow has been made especially strong, with a view to sailing through ice. The four holds are designed for carrying grain cargo, provision being made for the usual trimming boards to prevent bulky cargoes shifting in a sea-way.

On the boat deck there are four sets of Welin davits carrying two lifeboats and two dingies. On the poop deck there are two more sets of Welin davits, one carrying the motor-launch, and the other being in reserve. Passenger accommodation, consisting of six spacious cabins for two persons each, is provided, also a lounge, smoking-room and dining saloon. The lounge is entered from a staircase and is panelled in rich mahogany, and has lofty windows and very comfortable lounging chairs. On the wall of the saloon is an oil-colored portrait of Miss Florence Muysken, daughter of J. Muysken, Managing-director of the Werkspoor Company. It is interesting to note that Miss Muysken's mother is an American, and several months ago this connection was further cemented by Mr. J. Muysken, Jr., marrying an American lady on occasion of a recent visit to the United States, where he was studying at the Diesel engine-works of one of the American Werkspoor licensees.

During the luncheon, Captain Ole Bugge, one of the partners of Winge & Co., in his speech referred to a very interesting point in connection with the shipbuilders. Present at the table was Mr. D. Goedkoop, Sen., until recently managing director of the Nederlandsche Scheepsbouw Maatschappy, with whom the contract was placed. During the construction of the vessel, Mr. Goedkoop retired, and his place was taken by his eldest son, Mr. D. Goedkoop, Dzn., who was also present. Also of the luncheon party was Mr. D. Goedkoop, Jun., the son of D. Goedkoop, Dzn., the lad being the fourth engineer of the "Tosca," in order that he might get some sea experience before taking his place in the Nederlandsche Scheepsbouw Maatschappy. Another rather interesting feature of the proceedings was that as the owners were Norwegian and did not understand Dutch, all the speeches were in English. This particular incident indicates the extreme value of "Motorship" and its work in publishing in English a record of international progress in motorship and Diesel-engine construction. [We had the pleasure of recently meeting Capt. Ole Bugge on the occasion



M.S. "Tosca." The electrically-driven air-compressor.

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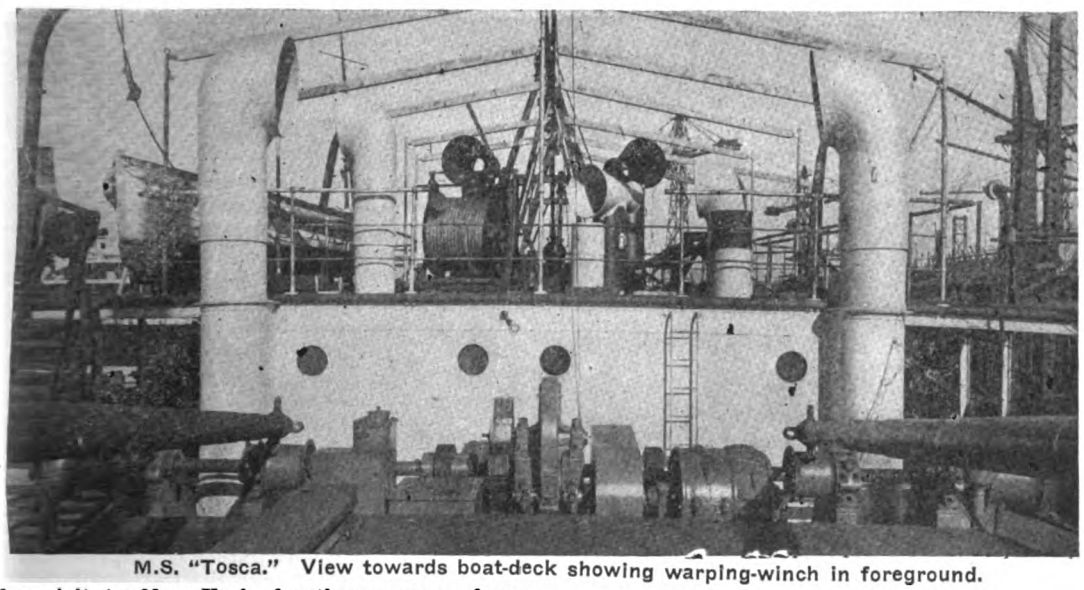


M.S. "Tosca." View towards boat-deck showing warping-winch in foreground.

of a visit to New York, for the purpose of purchasing supplies and making other arrangements in connection with his company. He emphasized his belief and the belief of his company in the Diesel-engined ship and its remarkable future. Capt. Bugge is a very keen reader of "Motorship." —*Editor.*]

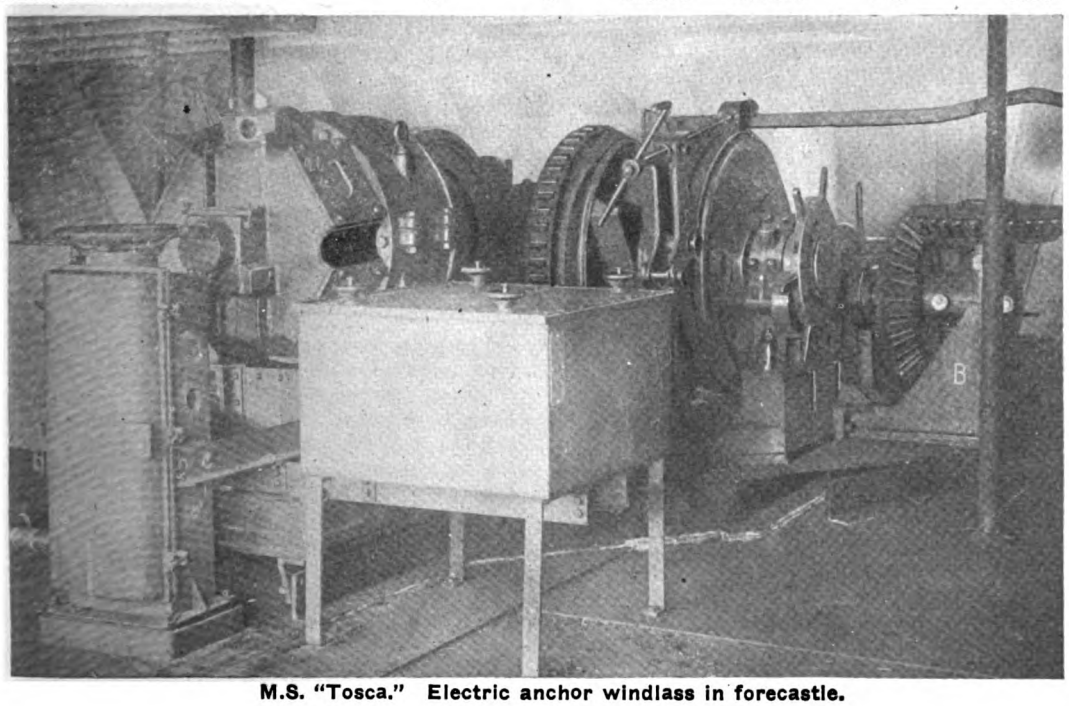
The accommodation is in the bridge deck-house, also contains the captain's cabin, pilot house, chart-house and Marconi wireless station.

Liquid-fuel and water-ballast are carried in the ships' double-bottoms, which extend over nearly entirely the length of the hull. Between the two tail-shaft tunnels the space is used for oil-bunkering, while drinking-water is carried in three big tanks between decks amidships.

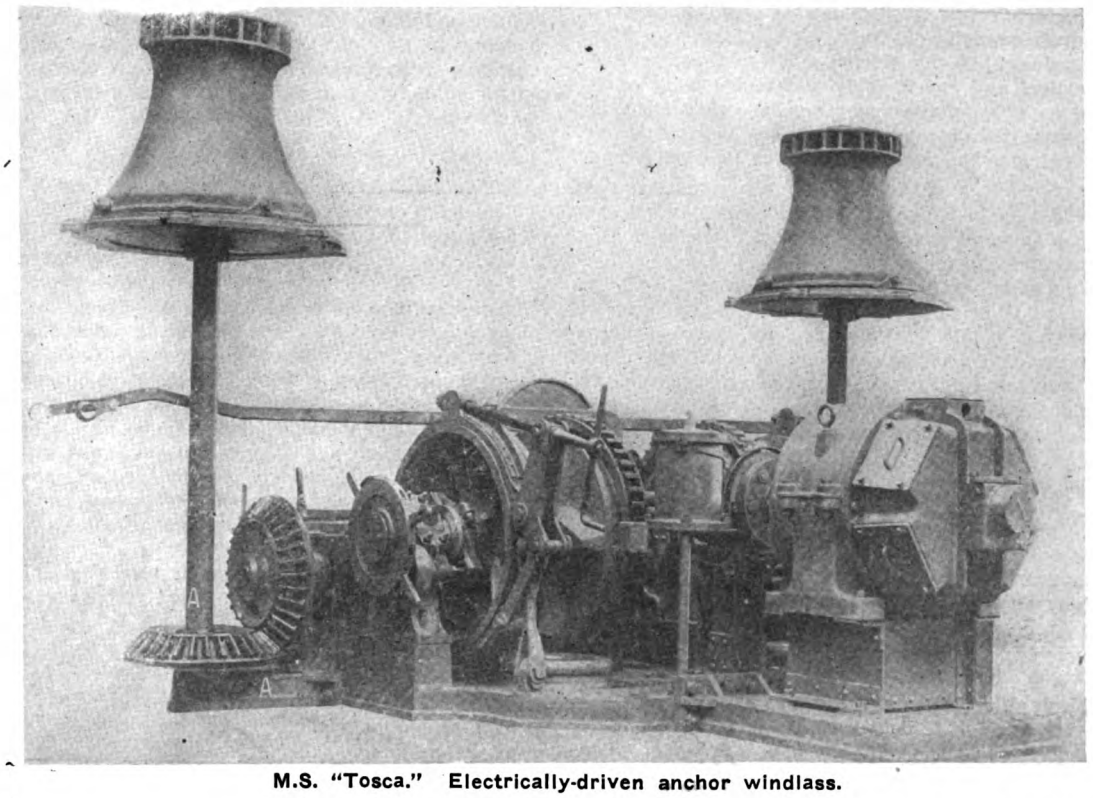
The donkey-boiler, which is provided in order to supply steam for heating the oil and cleaning out of the tanks and also for heating the acommodation, is oil-fired, and has a heating surface of 265 sq. ft. and a grate area of 12 sq. ft. The sound signals are given either by an ordinary organ-pipe whistle blown by compressed air, or by an electrically-operated whistle, which is placed high up on the derrick mast amidships.

Returning to the twin propelling engines—generally speaking, the design is similar to those installed in the "Athene" and "Salerno" and in the main resemble the Werkspoor Diesel-engine of the same power installed in the motor-tanker "Juno" ordered by the Anglo-Saxon Petroleum Company in 1911. Since the "Juno" was ordered there have been built or under construction no fewer than 28 Werkspoor Diesel engines of the same cylinder dimensions and power for eighteen motorships, and the "Tosca" is the tenth motorship with engines of this output now completed. The length of this engine is 29½ ft. There are four other types of Werkspoor engines developed, a standardized table being as follows:

TYPE (Name of first ship)	Power B.H.P.	No. of motors ordered	No. of ships ordered	No. of cylinders of each motor	Bore (ins.)	Stroke (ins.)	Speed revolutions per min.	Year in which first ship was ordered
"Juno".....	1100	28	18	6	22.047	39.370	125	1911
"Ares".....	850	10	5	6	20.472	35.433	130	1912
"Castor".....	350	8	6	4	15.748	27.559	175	1913
"Boelongan".....	500	4	4	6	15.748	27.559	175	1913
"Sardinia".....	1500	4	3	6	26.378	47.244	110	1917



M.S. "Tosca." Electric anchor windlass in forecastle.



M.S. "Tosca." Electrically-driven anchor windlass.

On November 6th the motorship "Tosca" left Ijmuiden Harbor for Christiania to take her cargo for her maiden voyage. Unfortunately, the motorship service run by Winge & Co. does not include the United States, although as stated, the Superintending-engineer of the company was recently in New York and expressed strong confidence in the reliability and economy of the motorship, particularly with the type of engines which they had adopted.

Launch of M. S. "Sardinia"

The Werkspoor-engined motorship, the "Sardinia," of 3,000 tons d.w.c. (see above table), was recently launched from the yards of J. & K. Smit of Kinderdyk, Holland, to the order of Otto Thoresen of Kristiania. We have previously referred to this vessel and she is of interest, inasmuch as she is a single-crew vessel propelled by a 6-cylinder, four-cycle Diesel-engine developing 1,950 to 2,140 i.h.p. at 110 to 115 r.p.m.

OUR FIRST YEAR BOOK

We particularly draw the attention of manufacturers, ship operators and other readers in the industry, to the announcement on another page of this issue of "*The Motorship Yearbook*" which is *the first annual review issued by this publication.* and allied industries, as it partly rests upon them to furnish very complete advertising material for the important catalogue section of this Yearbook.

The success of the book will partly depend upon the co-operation of firms in the motor-shipping and allied industries, as it partly rests upon them to furnish very complete advertising material for the important catalogue section of this Yearbook.

GARDNER-ENGINED COASTER

Two 90 b.h.p. Gardner surface-ignition oil-engines have been installed in the new 270 tons d.w.c. motor coastwise vessel "Corbichill" launched at Noble & Co.'s yards at Fraserburgh, Scotland. She is owned by the Fraserburgh Shipping Syndicate.

ANOTHER LARGE SAILING-SHIP CONVERTED

The ship-owning firm of Empreze Portuense de Transportes Maritmos, Ltd., of Oporto, Portugal, are having their 2,000 tons d.w.c. sailing-bark "Portugal" converted into a motor-auxiliary by Wm. Beardmore & Co. of Scotland. Two Beardmore surface-ignition type oil-engines of 200 b.h.p. each are being installed and a speed of 7 knots is expected under power. It is interesting to note that the vessel will be in the Atlantic service trading between the United States and Portugal.

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Allied Powers and German Diesel Engines

The Destruction of German Submarine Diesel-engines and Prohibition of Building High-speed Diesel engines in Germany

(SPECIAL TO MOTORSHIP)

Kiel, Germany, November 16th, 1920

CONCERNING the destruction of the Diesel motors in Germany, the prohibition to build additional Diesel motors was only contained in an inofficial communication of the president of the English commission to the president of the German commission.

In order to clear up the matter I will give a short description of the proceedings.

The decision of the ambassadors' council of the 3-9-20 is as follows:

1. The instructions of the article 189 of the peace treaty are not at variance with those of article 192.

2. Naval war material of all kinds (with the exception of equipment [French: material necessaire a leur armement] which belongs to the 6 light-cruisers and 20 destroyers and which is referred to in a letter of the Ambassadors' council of July 24th, 1920, to the president of the German delegation) as described and specified by the Niaco from case to case, no matter whether it comes from a dismantled vessel or not, is to be dealt with according to the instructions of article 192.

In the letter of the Allied peace commission of the 28-9-20, in which this decision is handed over to the German peace commission there is further mentioned the following:

You will therefore be requested to put the Niaco in a position to carry out the stoppage and destruction of all war material as specified under number 51 to 88 in the blue book; further you are requested to cancel all orders which go against the declaration of material as war material or its classification as such and destruction.

The blue book, to which reference is taken, contains the following under number 73:

Main-engines, boilers and auxiliary engines, no matter how operated, built in or originally designed for war-ships of all kinds inclusive of submarines.

Germany has protested against the decision of the Ambassadors council because according to Section 189 of the peace treaty which has the following wording:

Articles, machinery, and material arising from the breaking-up of German warships of all kinds, whether surface-vessels or submarines, may not be used except for purely industrial or commercial purposes. They may not be sold or disposed of to foreign countries, the destruction of submarine-motors cannot be demanded.

According to the decision of the Ambassadors council submarine motors must be dealt with according to Section 192 of the peace treaty, the building of high-speed Diesel-engines, as constructed for submarines in Germany would therefore be forbidden.

Section 192 of the peace treaty says:

The warships in commission of the German fleet must only have on board or in reserve the allowance of arms, munitions and war material fixed by the Principal Allied and Associated Powers. Within a month from the fixing of the quantities as above, arms, munitions and war material of all kinds, including mines and torpedoes, now in the hands of the German Government and in excess of the said quantities, shall be surrendered to the governments of the said Powers at places to be indicated by them. Such arms, munitions and war material will be destroyed or rendered useless.

All other stocks, deports or reserves of arms, munitions or naval war material of all kinds are forbidden.

The manufacture in German territory and the export of these articles to foreign countries shall be forbidden.

Basing on Section 189 Germany has sold a large number of the submarine motors through the builders, in the first place for stationary purposes and for the driving of merchant vessels. With the help of these engines it is possible for many Plants to carry on thier business in spite of the coal calamity. The destruction of the Diesel engines would therefore not only mean a totally superfluous destruction of valuable work but also increase the difficulties of the German industry in an unnecessary manner. The Diesel engines together represent a capital of at least 1 to 1½ milliards of marks. The capital invested in buildings, foundations and other inventory by the buyers of these motors amounts to about the same sum.

The prohibition of building high-speed Diesel-engines, as contained in the decision of the Ambassadors council with reference to Section 192, would do great damage to the German Diesel industry. Before the war high-speed Diesel-engines of the same type as submarine engines were built for electric power-stations. After the war this type of engine which has been very much perfected, will be very marketable on account of the great saving in material and the resulting low manufacturing and transport costs. It will be made use of in increasing numbers for power-stations of all kinds, especially as peak-load engines and as reserve. But also on merchant vessels these engines will be adopted in connection with electrical or mechanical power transmission in increasing manner instead of the very expensive slow-speed crosshead engines. Also for driving railway-cars and locomotives high-speed Diesel engines are especially suited.

Based on these facts the German foreign-minister Dr. Simons said at the conclusion of his speech in the Reichstag on the 29-10-20. "It was perfectly right, after all matters having been taken into account, if the German government had had a definite no for the unjust and senseless demand of the naval-control commission and was determined to stick to this no." In the meantime the decision of the Ambassadors' council has been made.

FROUDE DYNAMOMETERS

Through an error, not due to ourselves, an illustration of another design of Froude Dynamometer was given in the C. H. Wheeler Mfg. Co.'s advertisement on page 1125 of our December issue, instead of one of the three Froude Dynamometers on the test-floor of the Busch-Sulzer Bros. Diesel Engine Co.'s Works as stated. The correct illustration appears in their advertisement in the current issue.

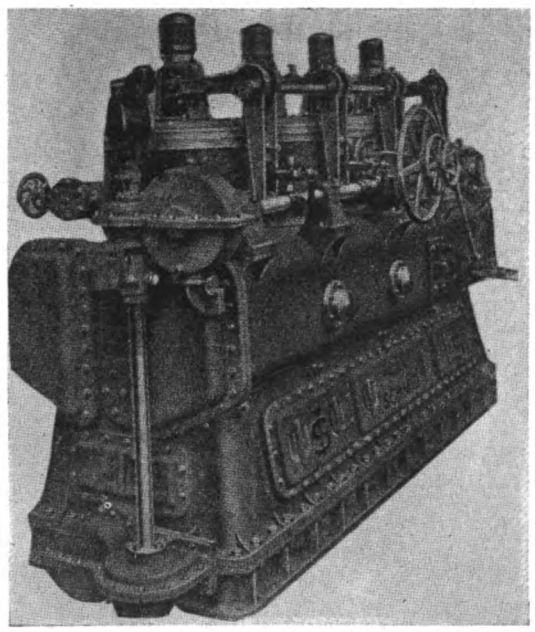
SUBSCRIBERS AND RENEWAL OF THEIR SUBSCRIPTIONS

Except in special circumstances, renewals of subscriptions are not acknowledged, the cancellation on the subscriber's check usually being sufficient indication that payment has been received by "Motorship." Furthermore, a subscriber can refer to the date of expiry of his subscription on every wrapper, to the right of his name. Thus, when this date is changed the subscriber will at once know that the renewal of his subscription has been received.

ITALIAN-ENGINED AUXILIARY MOTORSHIPS FOR GREECE

Several moderate-powered Diesel engines have been installed in Greek auxiliary sailing-ships by Ansaldo San Giorgio Ltd. of Turin, Italy. They are of two types and have been built in the shipyards of the Vocoto-Poulos & Co. One of these vessels is of the "Lover" type, and is of 350 to 400 tons. d.w., 90 ft. length, 23 ft. breadth, 12 ft. depth and 120 brake horse-power. The other vessel is of 600 to 650 tons d.w.c., 110 ft. long, 26 ft. breadth, 15 ft. depth and 200 brake horse-power. On the trials of these vessels a speed of about 8 knots was reached.

Work is now under preparation for the installing of the Ansaldo San Giorgio Diesel engines in a third motor-vessel for Grecian owners. Diesel engines installed by this firm are of the two-cycle type.



The effect of Diesel engine construction upon steam-engine design—a steam-engine built in Germany along the lines of high-speed Diesel engine practice.

BRITISH FIRM PURCHASES THE "FRITZ"

The large two-cycle double-acting Blohm & Voss built motorship "Fritz" has been purchased by the Ellerman Line, Liverpool, England.

MORE GERMAN WARSHIPS CONVERTED TO MOTORSHIPS

Two armoured cruisers of the "Hertha" class are being converted to motorships at the Danzig Shipbuilding yard. These vessels are of 5,660 tons displacement and will carry about 2,000 tons d.w. Each vessel has been installed with two submarine-type Diesel-engines for propulsion purposes.

DECISION OF ALLIED COUNCIL

The Allied Economic Council in Paris, in their answer of November 10th to the German Government regarding the 296 submarine type Diesel-engines that the Inter-Allied Navy Association had ordered destroyed under the terms of the Versailles Peace Treaty, gave notice that the sale of this machinery for industrial purposes would be permitted until the 31st of March, 1921, after which date such engines as had not been put into industrial service would be regarded as subject to Article 192 of the Peace Treaty, relating to the destruction of military material. The Allied Economic Council protested that it had no desire to hinder in any way the peaceful operation of German industry, and for this reason it would give Germany every opportunity to utilize the submarine type engines for peaceful purposes. The Asociation expressed its doubt concerning the suitability of the engines for such work, and stated that the German Government has presented only sixteen examples of such application. A similar statement was made on November 16th by Mr. C. Harmsworth, British Under-Secretary, for foreign affairs.

FORTY-NINE WERKSPOOR-ENGINED MOTORSHIPS

There are now in service and completing forty-four motorships fitted with Dutch-built Werkspoor Diesel-engines, aggregating about 192,225 tons displacement and 65,615 i.h.p. according to a list in the latest Werkspoor catalogue, a copy of which we have before us. In addition, there are five other motorships with Werkspoor engines built by American, British and French licensees, making a total of forty-nine merchant craft aggregating over 228,000 tons displacement and 73,500 i.h.p.

THE MOTORSHIP YEARBOOK

Owing to unexpected delays the publication of the "Motorship Yearbook" has been postponed from the beginning to the end of January.

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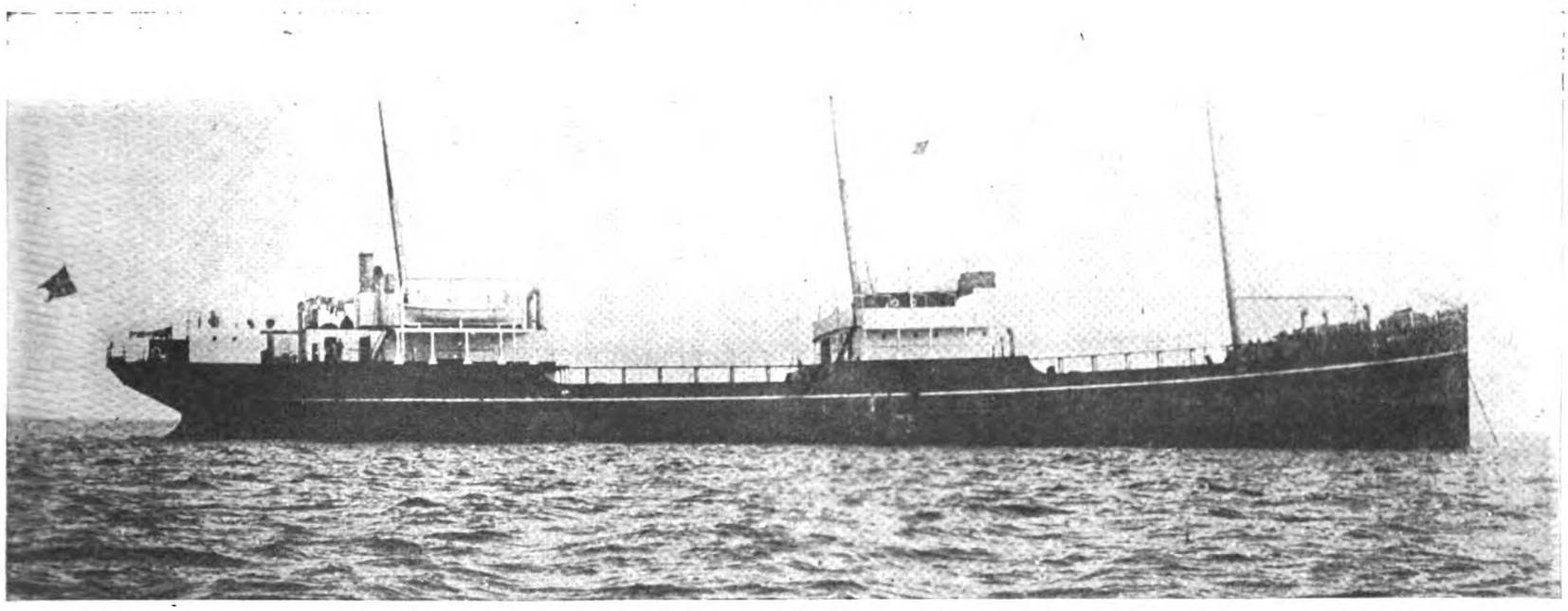

A bunker-supply ship. The motor-tanker "Mexico" of the East Asiatic Line. She is propelled by two Holeby-Diesel engines

A New Thought for Oil Companies

Operation of the Motor-Tanker "Mexico"—Interesting Details of the New Holeby-Diesel Design

FOR some years the question of oil-fuel supply has been one of grave concern to shipowners, especially to operators in countries that nature did not bless with a natural source of oil. Curiously enough, it is those particular countries which in recent years have been the largest adopters of oil-driven motorships for mercantile service. In these countries may be included Italy, Great Britain, Holland, Norway, Sweden and Denmark, and none of them have yet discovered sufficient mineral-oil to be worthy considering for use in seagoing vessels. This in itself became an obstacle of paramount importance to be met with discriminating foresight only.

In planning their motorships these shipowners have kept before them the fact that the low fuel-consumption of the Diesel engine enables a motorship to cruise around the world on a moderate bunker supply, and so she can easily pick up fuel-oil where it is the most plentiful and where it has the lowest price, provided she is on such a route. Nevertheless, they realize that with a ship on a short and definite route, such as Transatlantic service, the motor-vessel would be dependent upon one particular nation for its fuel supply.

Consequently, three of the leading European motorship owners, namely, the Transatlantic Company of Sweden, the Societa Nazionale di Navigazione of Italy, and the East Asiatic Company of Denmark, have each ordered a Diesel-driven tanker for the purpose of proceeding to any advisable part of the world and securing oil-fuel. As the consumption at sea of these tankers only varies from 5 tons to 12 tons per day, according to the size of the particular ship, they can proceed anywhere to obtain their cargo-oil, because they can return from the remotest parts of the Globe such as the Far East, where a very heavy grade of oil can be secured at low cost, and which oil is particularly suitable for Diesel-engines, and then return to Europe with their cargo-tanks full and upon arrival have sufficient bunker-oil left for the tanker to return to the oil-fields. By this method these three well-known motorship owners are now independent of any particular nation for the bunker-oil for their motorships, regardless of the route on which their cargo and passenger motor-vessels are plying.

As the aggregate consumption of their respective large fleets of cargo and passenger motorships is so extremely small, one Diesel-driven tanker of moderate size not only is sufficient to cover present bunker requirements, allows for further expansion. Meanwhile, the surplus bunker-oil can be sold to other shipowners in Europe less fortunate.

As an alternative the cargo motorships themselves can carry large quantities of surplus oil in their bunkers when they call at a foreign port where the price of oil is moderate. Not only do these shipowners cover their existing bunker requirements in this manner whenever possible, but are enabled to use this medium as an additional source of profit, which in itself is at times very considerable.

The new motor-tanker "Mexico," which has been built for the East Asiatic Company recently, made her second visit to New York. She is a vessel whose economical and technical characteristics will commend her to the careful attention of all those shipowners and others who appreciate an efficient combination of business and engineering.

In order to avoid interrupting the rapid succession of launching of cargo motorships at the Burmeister & Wain yard, the East Asiatic Company ordered her to be built at the Nakskov Yard and to be fitted with twin-screw engines from the Holeby Diesel Motor Works, at Holeby, Denmark. A very interesting little vessel has resulted, and we would recommend that executives of American oil-companies who have not yet gone in seriously for Diesel-driven tankers, should pay her a visit and take their superintending-engineers with them. As the "Mexico" is a supply-ship assigned primarily to the work of fueling the large motorship fleet of the East Asiatic Company, she gives eloquent evidence of the thoroughgoing business-like spirit and keen judgment as regards engineering detail with which this firm has undertaken ocean transportation.

Tables 1, 2 and 3 bear out these observations with actual figures from her first three one-way voyages. From the first of these it will be seen that the cubic-capacity of the oil-tanks bear a very favorable ratio to the gross registered tonnage of the vessel, and demonstrates again how the small machinery-space requirements of the Diesel-ship result in construction economy. The ridiculously small operating expense is attested to by table 2. The voyages on which these figures were recorded were made in bad weather, so severe that on one of them the gale kept blowing the ship's whistle through the sheer force of the wind against the ¼-inch whistle cable. Not a single mishap occurred, the engines kept running like oil, and the ship made excellent headway.

Regarding the engine room of the "Mexico." The arrangement is roomy, accessible, and gives the impression of high efficiency, one which it is impossible to reproduce by means of the drawings except to persons accustomed to this particular kind of presentation. Everything fits into the place assigned to it so sandily that the puzzling and scheming which must have been devoted to the layout to produce such a result is nowhere evident. It is no more than probable that the designer must have had the same thought the first time he saw his plans realized in three dimensions. Plans were published in our issue of April, 1919.

As may be seen from same, the Holeby engines are closely modeled after the well-known Burmeister & Wain machines, the two companies being related. The wide publicity which the latter have received would make it a repetition to give a complete description of the Holeby engines; the most useful thing will therefore be to consider only the most salient departures from the Burmeister & Wain designs. Of these the upper cylinder construction stands out most prominently. An examination of the photograph given in our issue of March, 1920, will remind the reader of the general type of construction with which we are dealing; but the new features can most readily be understood by referring to the sketch in Fig. 3.

Although the cylinder-head is substantially the same as the one visible in the photograph, it is not placed close to the water-jacket (A). A distance-piece of ring (B) makes a joint against the upper face of the water-jacket, and by means of rubber ring (C) is made tight against the flange of cylinder-liner (D). Water enters at H, circulates around the liner and escapes into the core of ring (B) through openings (E). The obvious purpose of the construction is to avoid the accumulations of thick metal which are found in the more usual designs. Considerably better cooling of the cylinder-liner flange in the region of the highest temperatures is thereby secured, a feature whose necessity has been emphasized in the past not only by injured liners, but by cracked water-jackets as well. Thick uncooled liner-flanges have heated and grown to such an extent that they burst the jackets surrounding them. The idea of placing the registering shoulder of the liner far enough down in the jacket to permit of cooling water application between it and the cylinder-head joint is not new, having been proposed, if not actually used by the Franco-Tosi Company years ago. They also go a step farther in constraining the water to flow through narrow grooves cast in the outer surface of the liner, thereby assuring intimate and active contact between the water and the metal.

An interesting "kink" about main-bearings is shown in Fig. 4. Since the cap of a bearing is nothing more than a girder having enough stiffness to hold down the actual bearing-shell without deforming it, and since it has been quite customary to make the cap consist of two such girders between two pairs of studs, the altogether natural course has here been followed of making the cap in two pieces. As a result, each casting by itself is small enough to be conveniently handled. The cap is to all intents as stiff as befor,e because it differs from the customary cap by the connective metal only, a portion which contributed little or nothing to the rigidity of the part.

Originality has also been shown by the Holeby designers in the treatment of the valve-gear. Al-

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though reversal is still accomplished by the use of double-cams and the sidewise shift of the camshaft, the method of clearing the cam-rollers during the latter process is different. Referring to Fig. 6, guide-link shaft (A) is straight and con-

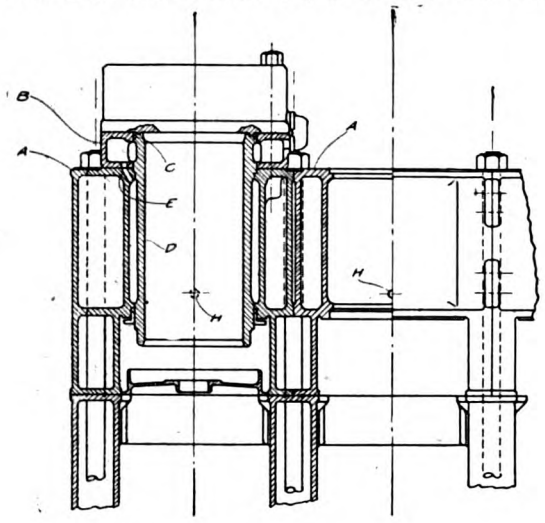

FIG 3.

centric over the length occupied by the guide link bushings, so that its rotation does not shift the big-end centers of the links. The cranks (B), however (one for each cylinder) are keyed to the guide link shaft (A), and a partial turn of the combination will shift the eccentric fulcrum shaft (C) by means of rod (D) and crank (E). Since the ball-end of the tappet (F) cannot leave contact with the valve spindle (see Fig. 5) the upward movement of the center of (C) produces twice the movement of push rod (H), which can now clear the cams. The system represents a bold applica-

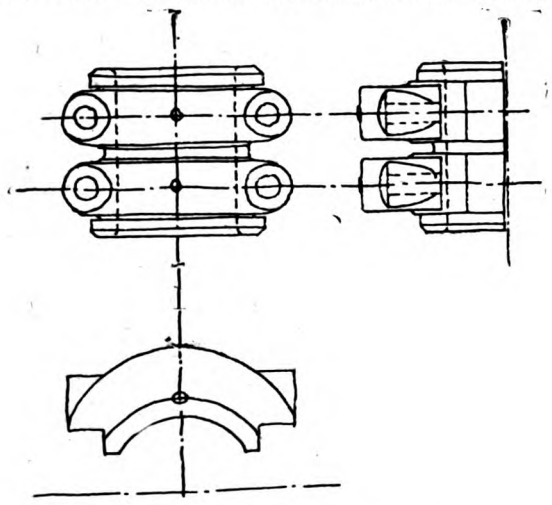

FIG. 4.

tion of the well-known eccentric fulcrum idea, so frequently used on stationary engines for cutting fuel and starting levers in and out.

In fact, the very same thing is also done on the Holeby engines, and the eccentric which governs the registry or non-registry of the fuel and starting levers is moved by means of a starting-air servomotor. Fig. 5 is a diagrammatic sketch of the arrangement. Tube (B) leads direct to the starting-air manifold, and communicates air to servomotor cylinder (C) as soon as the operator turns the starting-air wheel. A piston in (C) resisted by a spring in (H) operates a rack in housing (D) which acts on gear (E), and thereby turns cranks (J) and (K). The consequent depression of the center of (L) doubly depresses (M), and brings the cam-roller (N) down on the starting cam.

Compression relief is obtained in a manner illustrated in Fig. 6. When the center of the eccentric fulcrum (C) raises the left-hand end of the exhaust-lever (M), this member pivots under the set-screw (K), and causes a depression of the tappet (F) sufficient to vent any pressure that may have remained in the cylinder. During regular running, when the center of (C) is down in its normal position, there is clearance between (M) and (K), which increases as the valve is lifted. Like the regular Burmeister & Wain compression relief, it is merely "transitory." It insures that no piston will ever have to start moving against a pressure greater than atmospheric, a provision whose adequacy has been amply demonstrated.

Perhaps the most startling break with Burmeister & Wain tradition is embodied in the use of an upward opening fuel-valve. The design here followed is one so well established that further

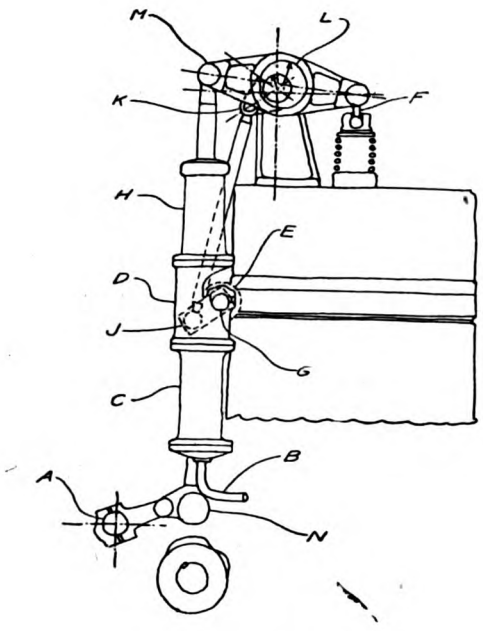

FIG. 5

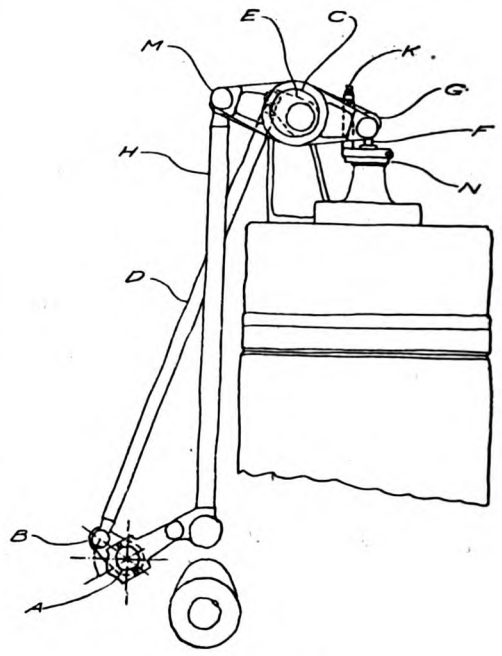

FIG 6

comment is unnecessary. As regards the downward opening valve, it will be remembered that the large area presented by the mushroom head requires that exceedingly minute valve-lifts be used. The order of magnitude of the lifts approaches that of errors due to manufacture and resulting from wear and expansion, with the consequence that the maintenance and control of the lift of downward-opening valves presents problems which possibly are not so pronounced in the case of upward opening valves. Much more might be said on this subject, but space does not permit.

Captain E. H. Jorgensen is enthusiastic about his ship and expressed an emphatic preference for motor propulsion as contrastd with steam. Handling coal is an expensive and time-wasting nuisance and mess. The modern Diesel-engine meets the standards set in steam-engineering practice for dependability in operation insofar as the machinery alone is compared. If, however, the hazard and unreliability of managing a crew of more less savage stokers is taken into account, the oil-engine benefits by the comparison. Captain Jorgensen says that during one voyage in a

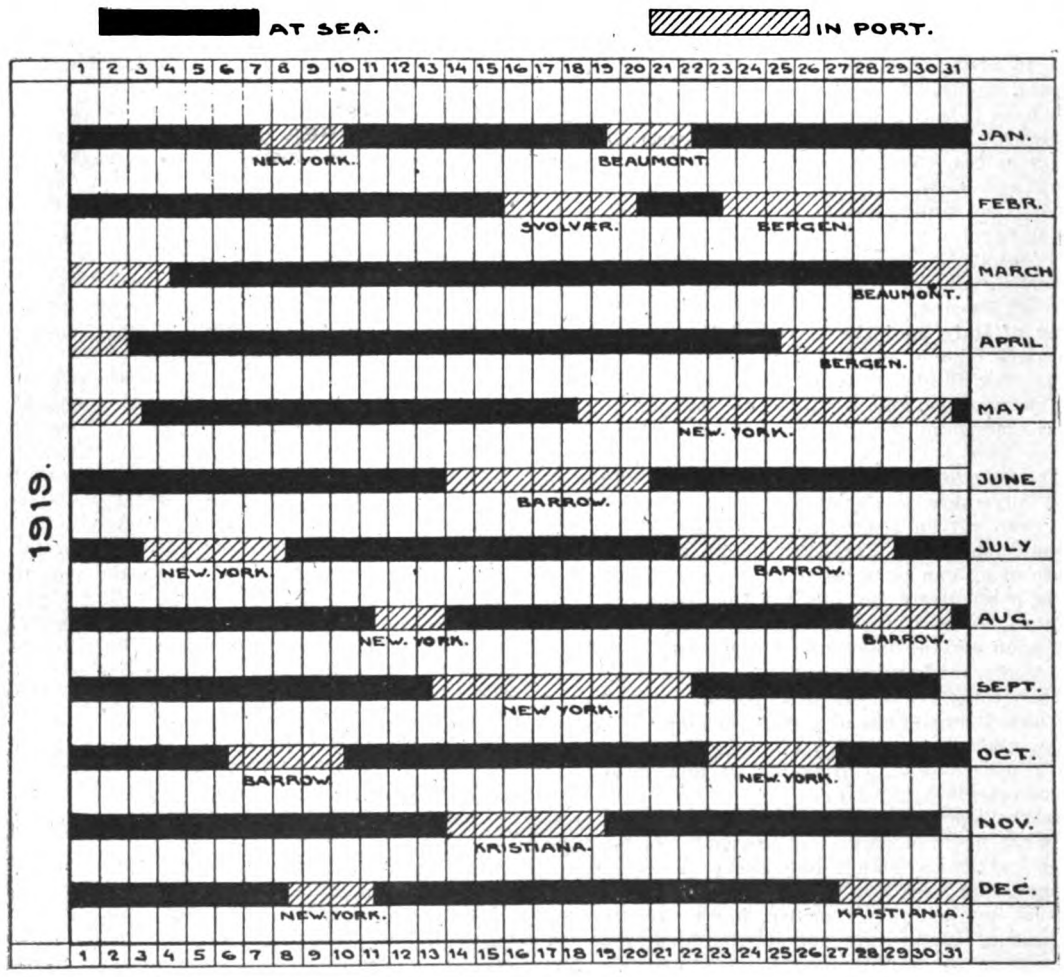

Chart of the voyages of the Polar two-cycle Diesel-engined tanker "Hamlet" during 1919. The black spaces represent the time at sea. Up to the end of 1918 she had covered 102,560 sea-miles in 30 voyages at an average speed of 9.81 knots on a daily fuel-consumption of 9¾ to 10 tons. The "Hamlet" is of 7,100 tons d.w.c., 10,500 tons displacement, and carries 6,300 net-tons of bulk-oil cargo in her holds. She was built by the Gotaverken. Her owners are Bruusgaard Kiosterud & Co., Drammen, Norway, who have a 9,000 tons d.w. Sulzer two-cycle Diesel motorship building at the Rosenberg Shipyard.

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ship requiring twenty-four stokers he had to lock up sixteen at one time. Attention is here called to table 2, from which it is seen that the engineering-crew of the "Mexico" comprises eleven men. These are persons selected because of their skill, training, and character. Their substitution for men of the stoker type adds to the overall security of the ship in a manner which commends itself to the attention of ship-owners and operators. It will be noted from the table that the "Mexico" has already covered 24,064 nautical miles in 2,762 hours, or an average speed of 8.71 knots using a total of 1,351 tons of fuel-oil as she is only of 1,100 shaft h.p. these results are excellent.

The Captain is much pleased because it takes just twenty minutes to get the ship under way from the time he signals to the Chief-Engineer, Mr. Einar Gundlach, to get ready. On the steamships he has sailed he had to give twenty-four hours' notice.

Mr. Gundlach is thoroughly pleased with the engines, and pointed out the excellent machine work on them. He showed our representative every courtesy, and assisted him in gathering the data on which this article is based.

VOYAGES OF MS. "MEXICO"
A Few Significant Figures

TABLE 1. SHIP DATA

Length (O. A.)	300′
Breadth (Moulded)	44′
Depth	28′
Mean loaded draught	24′
Dead-weight capacity, tons	4,450
Gross register, tons	2,750
Oil-cargo tanks, total cu. ft	163,340
Sumr. tanks, total cu. ft	22,760
Oil-fuel tanks with double bottom, total cu.ft.	16,490
Lubricating oil tank, total cu. ft	1,100
Total water tanks, total cu. ft	9,340

TABLE 2.* OPERATING DATA

	Copenhagen to New York ½ Cargo. Return Full Cargo	Copenhagen to Beaumont ½ Cargo Return Full Cargo	Copenhagen to New York ½ Cargo.
Distance, nautical miles	7,681	11,930	4,453
Speed, nautical miles per hr.	8.56	9.28	7.69
Total hours at sea	896	1287	579
Maximum nautical miles in one day	263	258	243
Average R.P.M. (for 1 week)	127.3	139	132
Mean Ind. Pressure—Stbd. (lbs. per sq. in.)	86.9	86.9	87.6
Mean Ind. Pressure—Port (lbs. per sq. in.)	84.1	86.9	87.6
Total fuel used tons	191.9	298	141
Fuel used per day, tons	5.13	5.56	5.85
Kind of Fuel	Borneo	Texas	Texas
Specific gravity of fuel	0.93	0.85	0.86
Lubricating oil used, lbs	3,030	4,730	1,924
Engine-room crew,			

*Averages do not cover all readings taken on trips.

TABLE 3. ENGINE DATA

Number of engines				2
Rated I. H. P. each				800
Bore (inch)				19.69
Stroke (inch)				28.74
Rated R. P. M.				140
Test block I.H.P.	876	(Stbd.)	909	(Port)
Test block R. P. M.	136	"	136.5	"
Test block M.I.P. (lbs.)	93.4	"	97.9	"
Dynamometer Power (B. H. P.)	550	"	582.5	"

Interesting Notes and News from Everywhere

VICKERS HAVE JAPANESE LICENSE

A license to manufacture Vickers solid-injection Diesel-type oil-engines is held by Mitsubishi Zosen Kaisha of Japan. It is incorrect that Vickers Ltd. are engaged in constructing Diesel-engines for large Japanese submarines as has been reported.

MOTORSHIP "CANADA" LAUNCHED

On Nov. 30th the Diesel-driven motorship "Canada" of 9300 tons and of 3100 i.h.p. was launched at the Götaverken shipyard, Göteborg, Sweden, to the order of the Rederiaktiebolaget Nordstjernan (Johnson North Star Line) of Stockholm. She is a sister vessel to the motorships "Balboa" and "Buenos Aires."

KITCHEN REVERSING RUDDER

In our November issue on page 1010 we mentioned that the rights for the Kitchen reversing-rudder had been acquired by the McNab Company of Bridgeport, Conn. This perhaps is misleading, as the McNab Company are not owners of the manufacturing rights, but are representatives in the United States for the Kitchen Reversing Rudder Co. Ltd. of Great Britain.

SULZER-ENGINED CONCRETE MOTORSHIP

An 800-ton d.w.c. concrete cargo-motorship has been built for the Baltisch Rederei of Hamburg, and trials were recently run. Her builders were F. R. Sternemann & Co. of Wewelsfieth, Germany, and she is propelled by a four-cylinder two-cycle type Sulzer-Diesel engine of 400 shaft h.p.

TWO MOTORSHIPS FOR HANSA REEDERI

Two Sulzer Diesel-driven motorships of 9,000 tons and 6,000 tons d.w.c. respectively are under construction for the Hansa Reederi, Bremen, Germany. The 9,000 tons vessel is of 3,200 shaft h.p. and the smaller craft of 1,600 shaft h.p. They also are having built an auxiliary sailing-vessel in which two 420 shaft h.p. Sulzer Diesel engines are being installed.

NEW MOTORSHIP FLEET FOR CAPT. BROR M. BANCK

Reference was made to the converted steamship "Augusta" in our December issue. This is the first of a fleet of similar motorships to the order of Capt. Bror M. Banck of Stockholm, as follows:

Cargo Ship	9,000 tons d.w.c.	2500 shaft h.p.	Twin-screw
Cargo Ship	9,000 tons d.w.c.	2500 shaft h.p.	Twin-screw
Cargo Ship	6,000 tons d.w.c.	1600 shaft h.p.	Twin-screw
"Augusta"	5,000 tons d.w.c.	800 shaft h.p.	Single-screw
	29,000	7,400	

All the above vessels are fitted or are being equipped with Sulzer two-cycle type Diesel engines.

FOUR MOTORSHIPS FOR SVEA SHIPPING COMPANY

Trials of the first three Diesel steel motorships each of 2,500 tons d.w.c. for the Svea Shipping Co. of Stockholm have just been carried out by the Finboda Shipbuilding Co., and these vessels are propelled by Polar two-cycle Diesel engines. The same company owned the motorship "Gestrikland," which was converted from a steamer many years ago. The results of her operation caused them to order three larger Diesel-driven motorships.

MOTORSHIPS EARN 8,400,000 KRONERS NET

The East Asiatic Company, which exclusively operates motorships, made a profit of Kr. 8,400,000 during the last year and have paid a dividend of 40 percent.

THE BOLNES ENGINE

The Bolnes surface-ignition marine oil-engine has been built as an open-type engine since 1912 not 1919, as stated thro' a typographical error in a recent issue.

SWEDISH EAST ASIATIC CO. ACQUIRE ANOTHER MOTORSHIP

The Polar Diesel-engined motorship "Svealand" of 1600 tons, which for the past year has been trading between Swedish and British harbors in the lumber and coal business, has been acquired by the Swedish East Asiatic Co. of Göteborg.

NEARLY 11,000 AMERICAN DOCUMENTED COMMERCIAL MOTOR-VESSELS

To give a comprehensive idea of the big development of the American commercial motor-vessel industry we are advised by the Bureau of Navigation of the Department of Commerce, Washington, D. C., that on June 30, 1920, there were no fewer than 10,711 American documented motor-vessels, aggregating 357,049 gross tons. No pleasure craft are included in this figure. This gross tonnage represents approximately 570,000 tons dead-weight-capacity.

SWEDEN'S MERCHANT MARINE

According to the latest returns Sweden has 1,147,117 gross tons of merchant-ships divided as follows:

		Tons Gross
Motorships	490	117,844
Steamers	1,230	914,740
Sailers	1,068	114,533
Total	2,788	1,147,117

The motorship tonnage figure represents approximately 188,500 tons d.w.c. and includes a large number of small oil-engined-coast-wise craft, as well as about two dozen big ocean-going Diesel-driven ships. Many of the sailing-ships are fitted with auxiliary oil-engines.

MOTOR VESSEL FOR VANCOUVER ALASKA FISHING SERVICE

A wooden vessel built in 1914 and docked in Seattle, named "Washington" was recently equipped with surface-ignition oil-engines by Capt. Judy, of Seattle. She was purchased by the New England Fish Company who have headquarters in Boston and a branch at Vancouver. They will place this vessel in the fish freight-service between Vancouver and Alaska, but the craft will be operated under United States registry. Going north she will carry general freight, coming south will transport fish.

LINDHOLMEN SHIPYARD MAY BUILD DIESEL ENGINES

Negotiations for a license to build merchant-ship type Diesel engines are now being carried-out with an important Diesel-engine firm by the Aktiebolaget Lindholmen Motala of Gothenburg.

THE WIGELIUS COMPOUND MARINE OIL ENGINE

A consumption of 130 grams per b.h.p. hour was recorded on the test of an experimental single-cylinder 120 b.h.p. compound type marine heavy oil-engine built at the Aktiebolaget Wigelius Motor Works, Gothenburg, Sweden. The fuel used in this test was Texas oil of 0.86 specific gravity and 10,100 British thermal units.

EAST ASIATIC COMPANY ORDERS SIX 15,000-TON MOTORSHIPS

With reference to the new 14-knot motorship of 15,400 tons d.w.c. and 22,000 tons displacement, 6000 i.h.p. ordered by the East Asiatic Company, announced on page 988 of our November issue, our Danish correspondent advises us that six vessels of this size have recently been ordered by the East Asiatic Company from Burmeister & Wain of Copenhagen.

NEW BRITISH MOTOR COASTER "HARPAREES"

The second of a new type of oil-engined coast-wise vessel was recently launched at the shipyard of Wells & Packham Ltd. of Sillingbourne, Kent. The vessel has been named "Harparees" and is of 250 tons d.w. She is propelled by a Vickers-Petters marine heavy-oil engine of the surface-ignition type developing 110 b.h.p. at 270 r.p.m. This gives the vessel a speed of 7 knots. Two of three sister motor-vessels now under construction will be propelled by twin 76 b.h.p. Vickers-Petters oil-engines.

ANOTHER MOTORSHIP FOR SWEDISH LLOYD

Several large motorships are under construction in Sweden for the Swedish Lloyd of Gothenburg, as previously stated in "Motorship." A small motorship has just been completed for them at the Limnhamn Shipyard to Bureau Veritas classification. This vessel has the following dimensions:

Displacement (loaded)	1450 tons
D.w.c. (including bunkers)	1000 tons
Length (O. A.)	182 ft. 6 in.
Length (b.p.)	147 ft.
Maximum breadth	28 ft. 9in.
Depth	13 ft. 11¾ in.
Depth of hold	11 ft. 9½ in.
Moulded depth	12 ft. 6¼ in.
Power	500 shaft h.p.

She is propelled by a four-cylinder 500 shaft h.p. two-cycle type Atlas-Diesel engine.

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MOTORSHIP

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THE MOTOR-SHIPPING QUESTION IN CONGRESS

As the result of the intensified efforts of "Motorship," assisted by the most valuable work recently accomplished by Mr. Wm. Denman, Ex-Chairman of the Shipping Board, the leading members of both the Senate and the House of Representatives are now familiar with the enormous value of the internal-combustion oil-engined motorship in America's mercantile-marine. An indication of the current attitude of Congress is perhaps revealed in a letter from Senator Wesley L. Jones (Chairman of the Committee on Commerce and father of the now-famous Merchant Marine Act) dated Dec. 11, 1920, to the Editor of "Motorship." Senator Jones says:

> "I wish the Board would earnestly take up the matter of Diesel-engine construction. I want to see our shipping of the most efficient and economical type. In my judgment that is what we are going to have in order to build up our merchant marine and put it upon a permanent basis."

Recently we spent some little time in Washington and were enabled to form an opinion of the feeling of Congress over the neglect of the Board and Fleet Corporation to provide the country with types of merchant-vessels sufficiently economical in operation to conserve our dwindling oil supply and to be able to properly face foreign competition, also their neglect to adequately develop the marine Diesel engine with this object in view. Unless the utmost is done with the Board's present limitations, we anticipate Congress using a stiff broom and making almost a clean sweep through the construction and operating departments in the coming spring. Unfortunately, Admiral Benson—who has expressed himself as a firm believer in the overseas-competition value of the economical motorship—has found himself confronted with a tremendous amount of work and very low funds left over from the old Board's administration. His views are already outlined in a speech recently made before the American Petroleum Institute, reproduced elsewhere in this issue. However, we have again drawn his attention on this page to what we consider a misuse of funds by one of the departments in changing vessels from one class of steam to another when the vessels could be converted to Diesel power with advantage.

MORE GOVERNMENT GEARED-TURBINE SHIPS TO BE CONVERTED

Once again we feel it necessary to ask why the Shipping Board appears to have plenty of money for converting existing geared-turbine ships to turbine electric-drive when it does not seem to have any money for converting the same vessels or other "semi-obsolete" steam-driven merchant ships to Diesel-electric or direct Diesel drive. The contract for refitting and overhauling the steamship "Invincible" and for the replacement of the so-termed "war emergency type" of geared-turbine with turbine-electric drive has been awarded to the Tebo Yacht Basin Co., Brooklyn, N. Y. The cost of the work is $82,474.00 In the same issue of "The Journal of Commerce" in which this appears; namely, Monday, Dec. 13, 1920, was an announcement that there are about 45 Shipping Board steamers in the New York district alone which have been tied-up with caretakers, and that more steam-ships are to be added to this idle list. We suggest that the officials of the Shipping Board responsible for the non-conversion of ships to Diesel power should read Mr. Denman's comments elsewhere in this issue.

WAR-TIME SHIPS TO PEACE-TIME SHIPS

A clear case for the oil-engined motorship and its economical importance in the American Merchant Marine was vividly portrayed before the Walsh House-Committee of Congress investigating the operations of the Shipping Board, by Mr. Wm. Denman, first chairman of the Board, and many extracts from his testimony are given elsewhere in this issue of "Motorship." How he planned a fleet of motorships, and how this was set aside by the Hurley Administration with the result that the country is now burdened with nearly 1500 oil-wasting, money-burning steamships, dozens of which are already commencing to rust and rot in harbors owing to the impossibility to operate them on the high seas of the world is fully revealed. Mr. Denman made it perfectly clear that his sincere belief in the value of the motorship to the nation was the sole reason for his testimony and for his appeal to Congress to appropriate funds for the conversion of a million tons of these "war-time" steamers to Diesel power, or alternatively build a similar tonnage of new merchant-motorships, to balance the existing fleet. Mr. Denman has no connection whatever with any firm in the industry and is urging the matter purely for *amor patriae*. The nation owes him a vote of thanks for having brought the question into the limelight. It is hoped that reflections of Congress over his recommendation will produce active results.

Adequate steps must be taken without delay in order to avoid almost our entire fleet being left to rust in harbors. Congress is strongly averse to making new financial appropriations because of the great importance of conservation; but where a small appropriation will produce enormous economies, we hope that Congress will approve even in the face of the doubtful results of past Government ship-building.

With one exception, all the vessels laid-down by the United States Shipping Board and Fleet Corporation have been war-time ships built for war-time purposes. No real attempt was made to construct ships specially suitable for peace-time operations, or to insure that such vessels were perfectly suited to meet all foreign competition on the high seas. In addition to Mr. Denman's recommendation to convert a million tons to Diesel power, we have proposed to Congress that, if possible, the Shipping Board or Fleet Corporation, in conjunction with a Committee of experts selected from officials of three old-established and responsible American shipbuilders, be authorized to design and construct three different "model" or "demonstration" merchant-ships of the most modern, the most economical and the most efficient type, based on the very latest European practice, and turn these over to private shipowners (as examples of ideally economical craft) for operation under the supervision of the Board as soon as completed, with the understanding that all technical and operating experiences thus gained shall be made available to all bona-fide American shipbuilders, shipowners, marine-engine builders and naval-architects, and that a sum of $8,500,000 be appropriated, or a fund created, for that purpose.

That the three "model" vessels be of the following specifications:

TYPE	Tonnage (D.W.C.)	Shaft (Horse-P.)	Speed (Loaded) (knots)	Daily Fuel Consumption at Sea (tons)	Approximate Cost
Combination Passenger-Freighter....	20,000	8,000	15	35	$3,300,000
Tanker.....	15,000	5,500	14	24	2,500,000
Express-Freighter....	10,000	4,000	14	17½	1,600,000
Total.....					$8,400,000

Enormous advantages would accrue from having three such economical and up-to-date merchant-ships in "demonstration-operation." Shipowners and shipbuilders then would be enabled to obtain all technical and operating information regarding craft similar to those now being developed in Europe; only these three U. S. Government-built vessels would be a little in advance of most of the ships now building abroad.

If the three foregoing vessels were basically constructed upon the very latest European practice with American improvisation, each would carry from 1,000 to 1,500 tons more cargo per one-way voyage than could existing American war-time built oil-burning or coal-fired steamers of approximately similar hull and speed specifications. Furthermore, these "model" ships would have daily-consumptions of fuel-oil that would amount to only one-third of the fuel-oil at present used by American war-time built steamers of similar hull dimensions and speed. In fact, practical operation of a 14-knot tanker is only feasible because of the low fuel-consumption of the Diesel-engine. Thus, in addition to being able to compete on the Seven Seas with any European vessel afloat, these craft would assist to economize America's dwindling supply of oil. Also, their excellent speed would enable a maximum number of voyages per annum and thereby again increase their earning capacity.

One of the ships could be equipped with internal-combustion engine-electric drive, which Admiral Benson has been advocating. The other two, of course, would have two and four-cycle type direct-connected internal-combustion heavy-oil engines respectively; but, of course, the type of machinery would first be approved by the Board before laying-down the ships.

FIRST MOTORSHIP UNDER TAX EXEMPTION CLAUSE

The U. S. Shipping Board has approved of the construction of the 6,000 tons d.w.c. cargo motorship for the Alaska Steamship Co. under the excess-profits tax exemption clause of Section 23 of the new Merchant Marine Act. This vessel it will be remembered is being built by the Todd Dry Dock and Shipbuilding Co. of Tacoma, Wash., and will be propelled by two 1200 shaft h.p. McIntosh & Seymour Diesel engines.

BOILER BUILDER DEPRECIATES DIESEL ENGINES

Whether it is a deliberate attempt to depreciate and damn the value of the Diesel engine and to mislead prospective users regarding its present advanced development, or whether it is a question of sheer ignorance of the subject, is probably only known to the author of the article entitled

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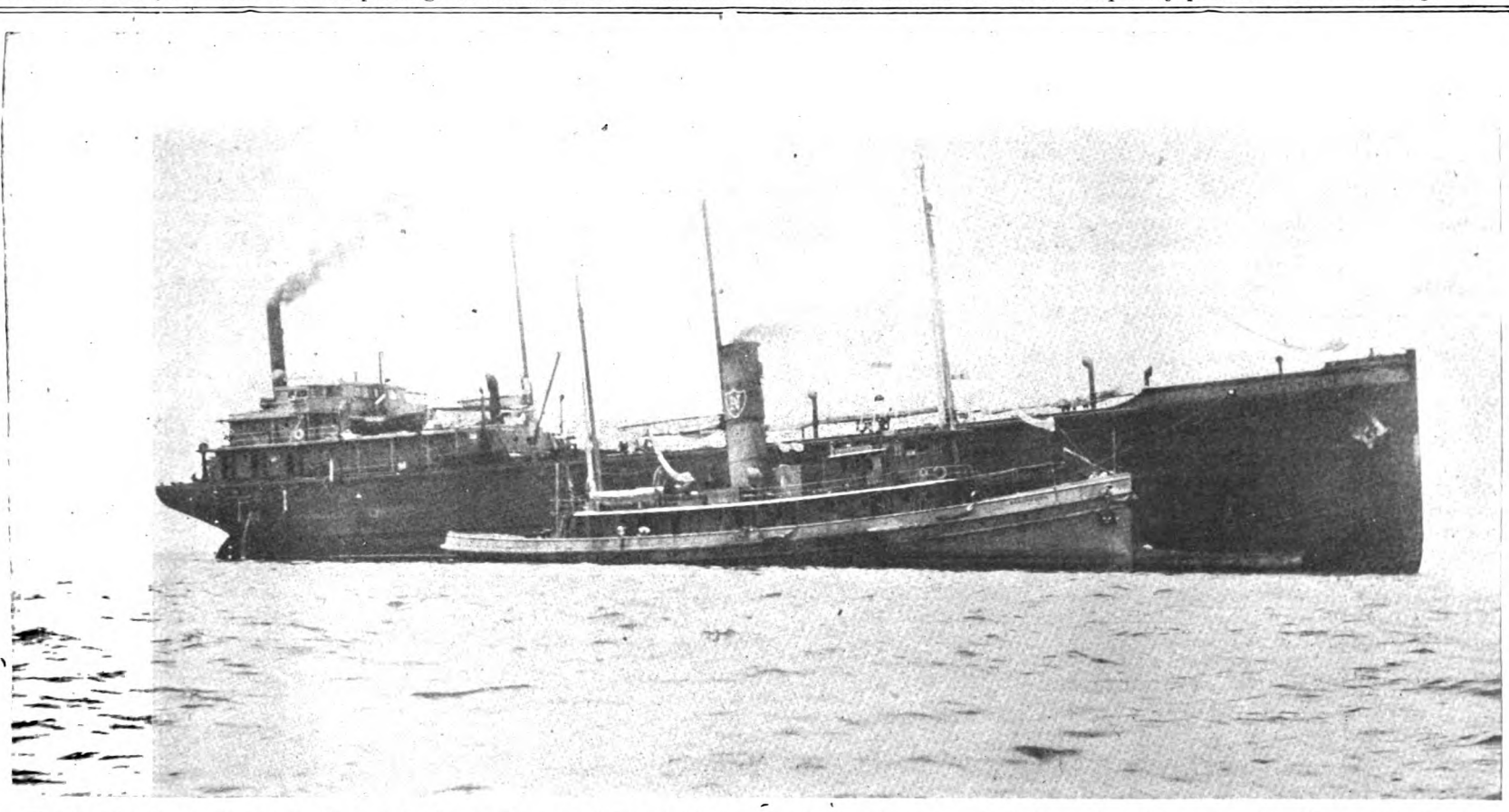
"Common Sense in Engineering," published in the Nov. 25th issue of the "American Machinist." The article in question was contributed by Walter M. McFarland, manager, Marine Department, Babcock, Wilcox Co., the well-known marine-boiler manufacturers of New York. The following are some of his very inaccurate statements:

> (1) "marine records of good average practice are ½ lb. of oil per brake-horsepower for the Diesel engine and about 1 lb. of oil per indicated-horsepower for a good reciprocating-engine plant."
>
> (2) "the extent of the use of Diesel engine has been a great disappointment to its advocates, and at the present time relatively few are being installed in new vessels."
>
> (3) "it became apparent that they were all designed with a horsepower per cylinder which did not exceed 250 to 300. At first there were a great many vague statements that experiments were in progress with cylinders to give from 1,000 to 4,000 h.p. per cylinder. In one such experiment there was an explosion with serious consequences. At all events, for some time there has been no talk of these more powerful cylinders.
>
> (4) "Why is it that the Diesel engine cannot be built in large sizes? And here common sense gives us the answer quite simply. Like all other internal-combustion engines, the Diesel engine requires that the cylinders be water-jacketed so as to keep the barrel sufficiently cool to permit the proper working of the pistons. The pressures carried are quite high, from 700 to 1,000 lbs. per square inch, requiring a thick cylinder even for a power of 250 to 300 h.p. The fact is that this thickness is evidently about the maximum which will permit the interior cylinder wall to be kept of a sufficiently low temperature for satisfactory working."

We emphatically maintain that Mr. McFarland cannot prove any of the above statements, and offer him the privilege of our columns to make his attempt. On the other hand, we will demonstrate the incorrectness of his claims. In the first place, no large motorship placed in service this last five years has shown a fuel-consumption exceeding 0.43 lb. per brake (shaft) horse-power and the majority show a regular consumption of 0.41 lb. per brake horse-power, or from 0.28 to 0.32 lb. per indicated horse-power —including all auxiliaries—at sea. Again, we do not know of any Diesel engines with normal cylinder pressures of 700 to 1,000 lbs.

Regarding his belief that only a few Diesel engines are installed in vessels at the present time, a recently published table shows that eleven motorships aggregating 138,210 tons are now under construction in the United States. In addition, seven 1,000 brake horse-power motorships are building for the U. S. War Department. Furthermore, in Mr. Denman's testimony before the Congressional Committee published elsewhere in this issue, he gives a list of 65 motorships aggregating 583,600 tons d.w. and 227,800 i.h.p. are now on order in Great Britain. This does not include all the British Diesel vessels nor the large fleet of motorships building for German, Danish, Dutch, Italian, Swedish and Norwegian owners, aggregating a total of about 150 Diesel-driven vessels. In addition there are about 500 motorships in service.

In connection with the horse-power of Diesel engines we would like to draw his attention to the cylinder out-put of the Bethlehem-West engine of the motorship "Cubore" and of the same make of Diesel engines for the four motorships of 20,000 tons d.w.c. building for the Ore Steamship Company and of the cylinder out-put of the Doxford engine also illustrated in this issue. Furthermore, if Mr. McFarland will refer to page 1074 he will see confirmation of the fact that the 12,000 shaft h.p. double-acting 6-cylinder Krupp Diesel-engine was completed several years ago and successful trials run. Many other high powered engines are under construction or in service as frequently published in "Motorship."



The wooden-built bulk-oil tanker "J. F. Penrose," owned and built by the National Oil Co. of N. Y., and used for carrying oil from Mexico to New Orleans, La. She is 317 ft. long and is propelled by one 750 shaft h.p. McIntosh & Seymour Diesel-engine originally constructed for the U. S. Shipping Board. This tanker was briefly described in the Jan., 1920, issue of "Motorship," page 20.

HOWALDSWERKE ADOPT SULZER LICENSE

A license to construct Sulzer marine-type Diesel-engines has been secured by the Howaldswerke (Howald Shipyard) of Kiel, Germany.

ATLANTIC TRANSPORT CO.'S SISTER MOTORSHIP AND STEAMER

Completed in Great Britain over six years ago, the 6,500 tons d.w.c. 3,600 i.h.p. B. & W. Diesel motorship "Mississippi" has run over 200,000 nautical-miles to date, consuming under 11½ tons of oil-fuel per day. She is owned by the Atlantic Transport Co., 9 Broadway, New York, and at the time of her construction was considered an experimental vessel. She operates between London and Baltimore, sometimes calling at New York.

The motorship "Mississippi" is a sister vessel to the steamer "Missouri," and owing to having twice the cruising radius on about half the quantity of fuel, and requiring no boiler-water, she can carry over 500 tons more cargo than the "Missouri." Also she only burns 11½ tons of oil per day compared with the "Missouri's" 39½ tons of coal. Furthermore, the S.S. "Missouri" is obliged to bunker at both ends of trip, whereas the M. S. "Mississippi" bunkers in the U. S. A. only.

NEW SHIP DIRECTORY

A very useful international book will be published shortly in Great Britain known as the Ship Compendium and Yearbook. It will consist of over one thousand pages and will contain a complete list of shipbuilders, shipowners, marine engineers, ports, harbors, dockyards, coaling stations, fuel-oil stations, cable and wireless stations, naval architects, naval colleges, nautical academies and institutions, banks and bankers, dock and harbor commissioners, boards of trade, admiralties and their officials, ministries and boards of shipping, ministries of transport, shipbrokers, flags and funnels of the mercantile marine, technical and professional societies, benevolent institutions, salvage associations and shipping registries, throughout the world. Tonnage and constructional statistics, the year's losses, ship and shipping law, insurance and indemnity, the British Admiralty, and many other subjects connected with the shipping world will be exhaustively covered. Even victualling stores in the different ports of the world will be included. Nothing of importance connected with this vast subject will be omitted. It will be a complete referendum of the world's shipping interests, arranged and classified alphabetically and geographically. The publishers are Compendiums Ltd., 18 Old Compton St., Soho Square, London, W. 1, England.

HIGH-POWERED JAPANESE SUBMARINES

Types Q-54 and Q-45 submarines of the Japanese navy are of very high power. The first mentioned is propelled by two eight-cylinder 3,000 shaft h.p. Sulzer two-cycle Diesel engines and the Q-45 is propelled by four six-cylinder 1,300 shaft h.p. Sulzer Diesel engines, or a total of 6,000 and 5,200 shaft h.p. per boat respectively.

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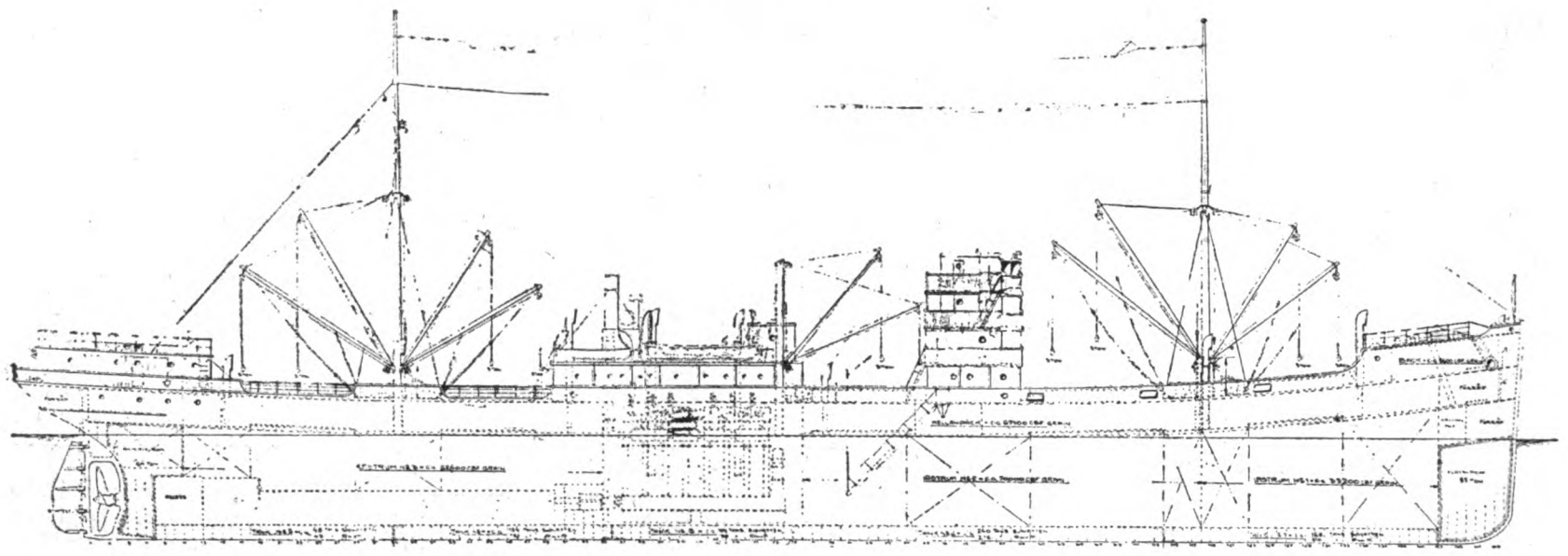


Plans of 4,450 tons d.w.c. motorship building at Oresunds to the order of the Swedish Orient Line. A new design of Götaverken-Burmeister & Wain. Diesel engine is being installed

Two Interesting Motorships Building at Landskron

NOW under construction for Swedish interests at the Oresunds Varvet (Oresunds Shipyard) at Landskrona, are two motorships of considerable interest. One is of 4,450 tons d.w.c., and the other is a larger vessel somewhat similar to the "Bullaren," "Tisnaren" and "Elmaren," recently constructed at the Götaverken Yard, Göteborg, but is of slightly greater dimensions, being of 10,400 tons d.w.c. Of special interest is the 4,450 tons motorship, as she will have the first of the new long-stroke, slow-speed, Diesel engine designed and built by the Götaverken in conjunction with Burmeister & Wain of Copenhagen, which engine has several features new to the B. & W. design.

One of these is a new form of cylinder-head and cylinder, in which water-cooling is facilitated directly around that portion of the combustion-chamber, where the heat is greatest, and which hitherto was partially prevented by the flanges of the cylinder-head and cylinder-liner. Furthermore, with this new design it is necessary to remove the piston from below instead of detaching the cylinder-head, so facilities have to be made for this purpose. Further details and drawings regarding this interesting feature will probably be given in our next issue.

We take the opportunity to mention that what is practically a duplicate of this motorship is now building for the Swedish Lloyd Line (H. Metcalfe interests), Göteborg, and this vessel will be of the same tonnage and power. The Oresunds boat has been built for the Swedish Orient Line (Dan Brostrom interests), as has the 10,400 tons motorship also building at the Oresunds Yard. Regarding the dimensions of the 4,450 tons boat building at the Oresunds yard, these are as follows:

New Design of Gotaverken-Burmeister & Wain Long-stroke Engine with Pistons Removable from Below

Net cargo-capacity	3,800 tons
Deadweight-capacity	4,450 tons
Fuel-capacity (maximum)	580 tons
Cruising range	105 days, or 25,200 sea miles
Daily fuel-consumption	5½ tons
Lubricating-oil capacity	6 tons
Fresh-water capacity	20 tons
Grain capacity	238,300 cu. ft.
Power	1,600 i.h.p.
Engine-speed	90 r.p.m.
Ship's-speed (loaded)	10 knots
Co-efficient	0.765
Length (b.p.)	299 ft. 6 in.
Breadth (md)	44 ft.
Depth (to shelter deck)	28 ft. 11 in.
Draught (loaded)	22 ft. 1¾ in.
Winches (electric)	10 of 3 tons
Class	Lloyds+100 A1

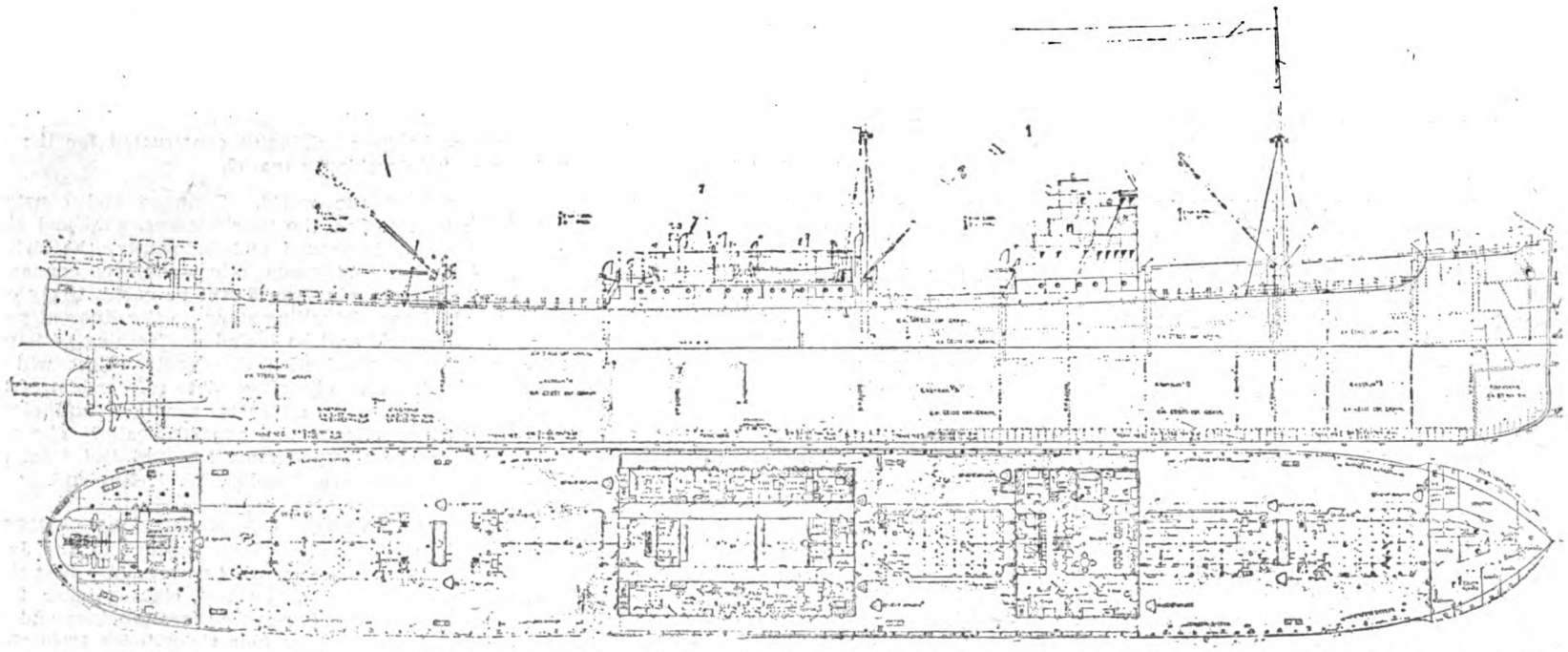
She will have a vertical stem and elliptical stern, with two deck houses amidships on the shelter deck for the accommodation of officers and engineers with lower bridge and boat-deck above, where is situated the captain's cabin, upper bridge and wireless-room. She will be a two-masted vessel with four derricks on each, and two derrick posts per derrick. The hull is of steel construction and will be divided by five water-tight bulkheads and in addition to the fuel-oil space there will be a capacity for 757 tons of water-ballast in the double-bottoms and peak-tanks.

The three holds have steel-grained bulk-heads between hatches. Their capacities are as follows:

Capacity	Cu. ft	Grain
No. 1 fore	Hold about	33,200
No. 2 fore	Hold about	70,000
Aft	Hold about	62,400
'Tween deck	Hold about	67,100
Forecastle		5,600
Total		238,300

As in the case of the winches the windlass will be electric-driven, while steering-gear will be of the hydro-electric type with telemotor. The current for this machinery, also for the electric-lighting and wireless-telegraphy is derived from Diesel-electric generating-sets in the engine-room. Heating is by steam from a small oil-fired donkey-boiler.

(*Continued on page* 49)



Plans of 10,400 tons d.w.c. Götaverken-Burmeister & Wain Diesel engined motorship building at the Oresunds Varvet, Landskrona for the Swedish Orient Line (Dan Brostrom) of Gothenburg.

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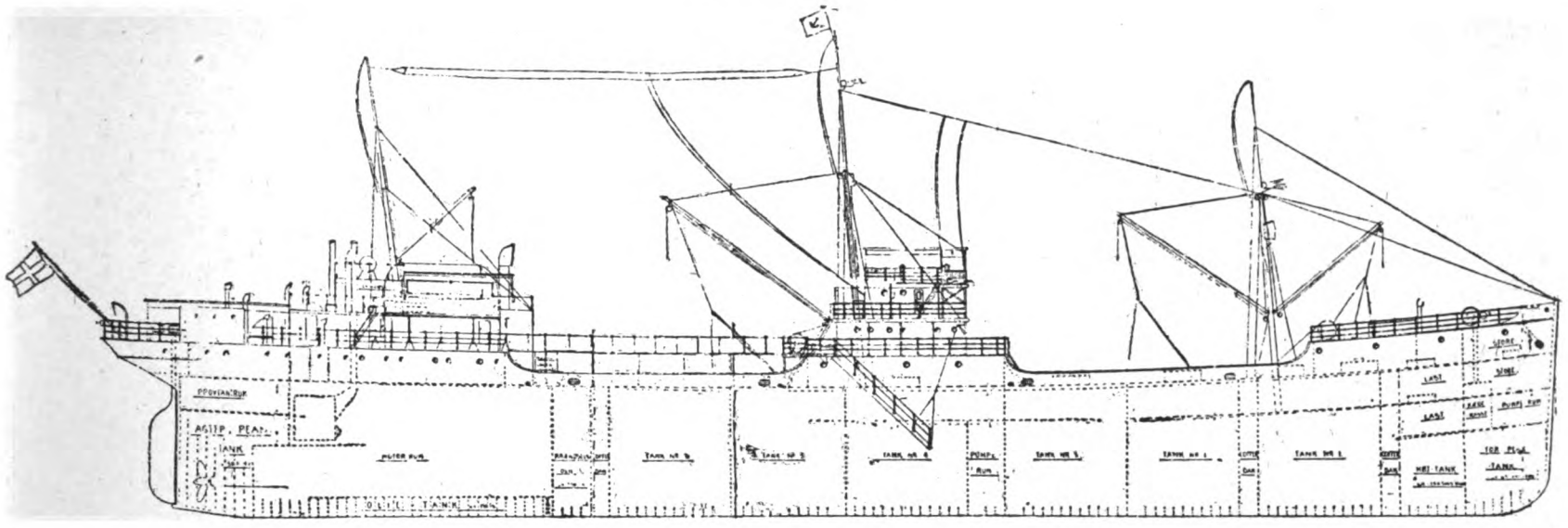


Longitudinal section of East Asiatic Co's motor-tanker "Mexico." She is described on another page in this issue.

(*Continued from page* 44)

Regarding the dimensions of the 10,400 tons boat, these are as follows:

Net cargo-capacity,	8,890 tons dry-cargo and about 900 tons oil-cargo
Dead-weight capacity	10,400 tons
Total oil-capacity (inc. fuel)	1,331 tons
Fuel-oil required on round transatlantic voyage,	360 to 400 tons
Daily fuel-consumption	12¼ tons
Fresh-water capacity	36 tons
Lubr-oil capacity	13.5 tons
Grain capacity of holds	569,300 cu. ft.
Power of main-engines	4,000 i.h.p.
Ship's speed (loaded)	12 knots
Co-efficient	0.76
Length (b.p.)	425 ft.
Breadth (Md.)	56 ft.
Depth (to shelter deck)	38 ft.
Draught (loaded)	27 ft. 6 in.
Winches (electric)	Two of 5 tons, eight of 3 tons
Class	Lloyds+100 A1

Generally speaking, she differs in design from the smaller motorship, this vessel having a cruiser stern, also three masts with ten derricks. Her ballast is divided into seven water-tight bulk-heads and she has a water-ballast capacity for about 1,623 tons. There are 5 cargo-holds with two rows of widely-spaced pillars at the side and one center row of ordinary pillars in the fore holds. Also two rows of wider-spaced pillars at the sides in the aft holds. Total capacity of the holds is about 569,200 cu. ft. not counting the 1,331 tons of oil-cargo and bunker-oil in the double-bottom.

She will be propelled by two Götaverken-built Burmeister & Wain Diesel engines, each developing 2,000 i.h.p., which will give her a speed of 12 knots. A complete set of refrigerating machinery is installed, and this will be electrically-driven. All the auxilliary machinery will be electric, power being furnished by three auxiliary Diesel engines in the engine-room, direct-coupled to generators. This also furnishes current for the electric-lighting and wireless telegraphy. Heating the ship will be by steam from a small oil-fired donkey-boiler.

EDITORIAL ARTICLES HELD OVER UNTIL NEXT MONTH

Owing to the illustrations not arriving, they having been delayed during transmission, we have been obliged to hold over a very interesting detailed article on the new Burmeister & Wain Diesel-engined motorship "Fritzoe" of 1,000 tons d.w.c., which recently ran sucessful trials in Norwegian waters.

We have also been obliged to hold over the first installment of a very interesting treatise on the experiment of solid-injection and air-blast in marine Diesel engines by Engineer-Comm. C. J. Hawkes. The first installment of this will now be published in our February issue.

Furthermore, we regret having been obliged to hold over the second installment of Mr. J. L. Chaloner's interesting technical article on "Solid Injection or Mechanical Injection" until our February issue. The amount of new construction has caused this great demand.

VOYAGES OF THE NEW MOTOR TANKER "NARRAGANSETT"

Results of Vickers Solid-Injection Diesel Engines in Service

	New Orleans to Liverpool, July, 1920 (Maiden Trip)	Barrow to New York, Oct., 1920	New York to London Nov. 1920
Total distance (nautical miles)	4,528	3,013	3,204
Running time (hours)	408	325.5	313
Average speed, actual (knots)	11.1	9.25	10.2
Mean revolutions of engines	118.	111.	117.3
Engine-fuel used per day (tons)	9.61	9.36	10.51
Auxl. boiler-fuel used per day, (tons)	2.13	2.16	1.71
Total fuel-consumption per day, (tons)	11.74*	11.52	12.22

*According to information received by Vickers Ltd. from owners regarding similar oil-fired steam-vessels, their average speed is 10.26 knots, and the daily-consumption of oil works out at 35 tons, while the daily-consumption of fuel in a coal-fired steam tanker very slightly larger than the "Narragansett" is 55 tons at 9.8 knots. The reduction in speed of the "Narragansett," compared with the first voyage is due to heavy winter weather.

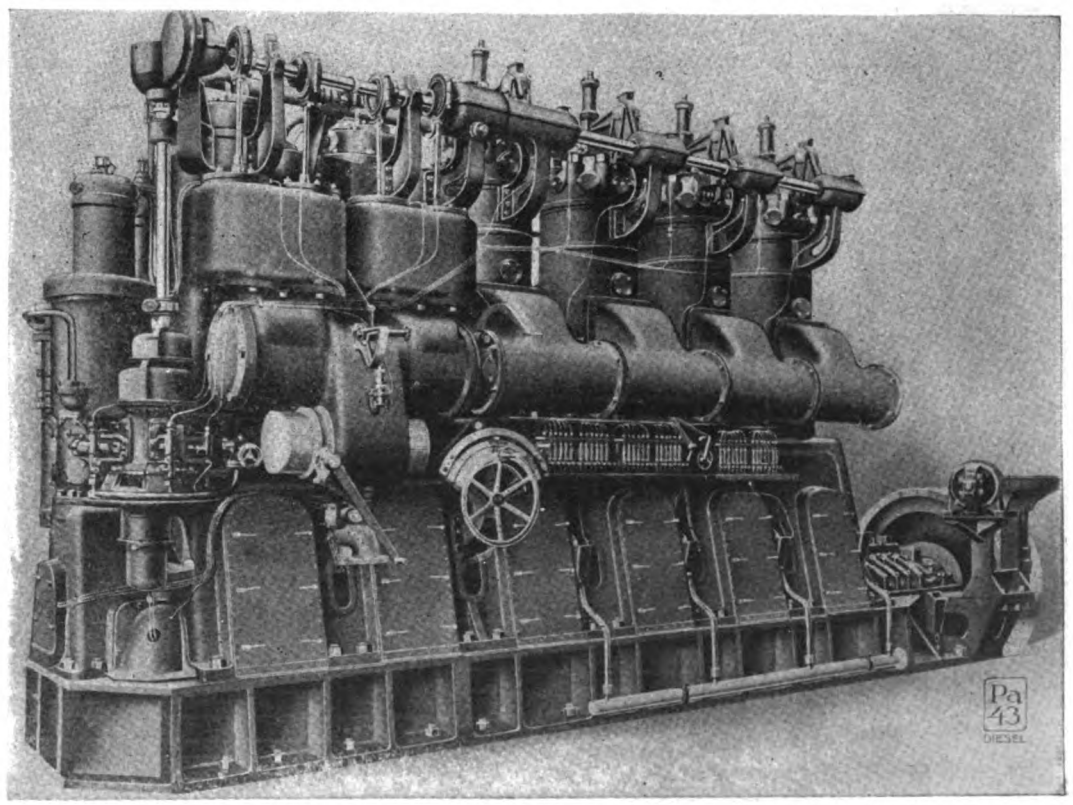
MATSON CO. TAKE RETROGRADE STEP

In these days of obvious economies and reliability of the Diesel-system of propulsion it is somewhat of a surprise to learn that the Matson Navigation Co. of San Fransico, have decided to tear-out the present steam machinery of their steamer "Enterprise" and install a new steam reciprocating-engine. The vessel at the same time is being reconditioned and the total cost will be $180,000.00. The contract has been awarded to the Moore Shipbuilding Co. Incidentally, we will mention that Mr. George Armes, President of the Moore Shipbuilding Co. is a very strong believer in the Diesel-drive and has frequently made public his belief that American steam-driven ships cannot compete with foreign shipping.

A statement regarding the opinion of Robert Moore, Vice-President of the Moore Shipbuilding Co. appears in the speech of Mr. M. L. Requa of the Sinclair Oil Co. published elsewhere in this issue.

ROYALTY VOYAGE ON MOTORSHIP

The recent trip of the King and Queen of Denmark to England, France, and Italy was made on board the fine passenger-cargo Diesel-driven motorship "Fionia" of the East Asiatic Company. This vessel has de luxe accommodation for 40 passengers, and when she was first placed in service even carried an orchestra. She is of 7,000 tons d.w.c. and of 4,000 i.h.p. and 13½ knots speed. At the time she was launched she was the highest-powered motorship in the world, and is still one of the most beautiful craft of her size afloat. She was built and engined by Burmeister & Wain of Copenhagen, in 1913.



One of the 500 shaft h.p. Polar Diesel engines of the motorship "Finn," illustrated on page 50

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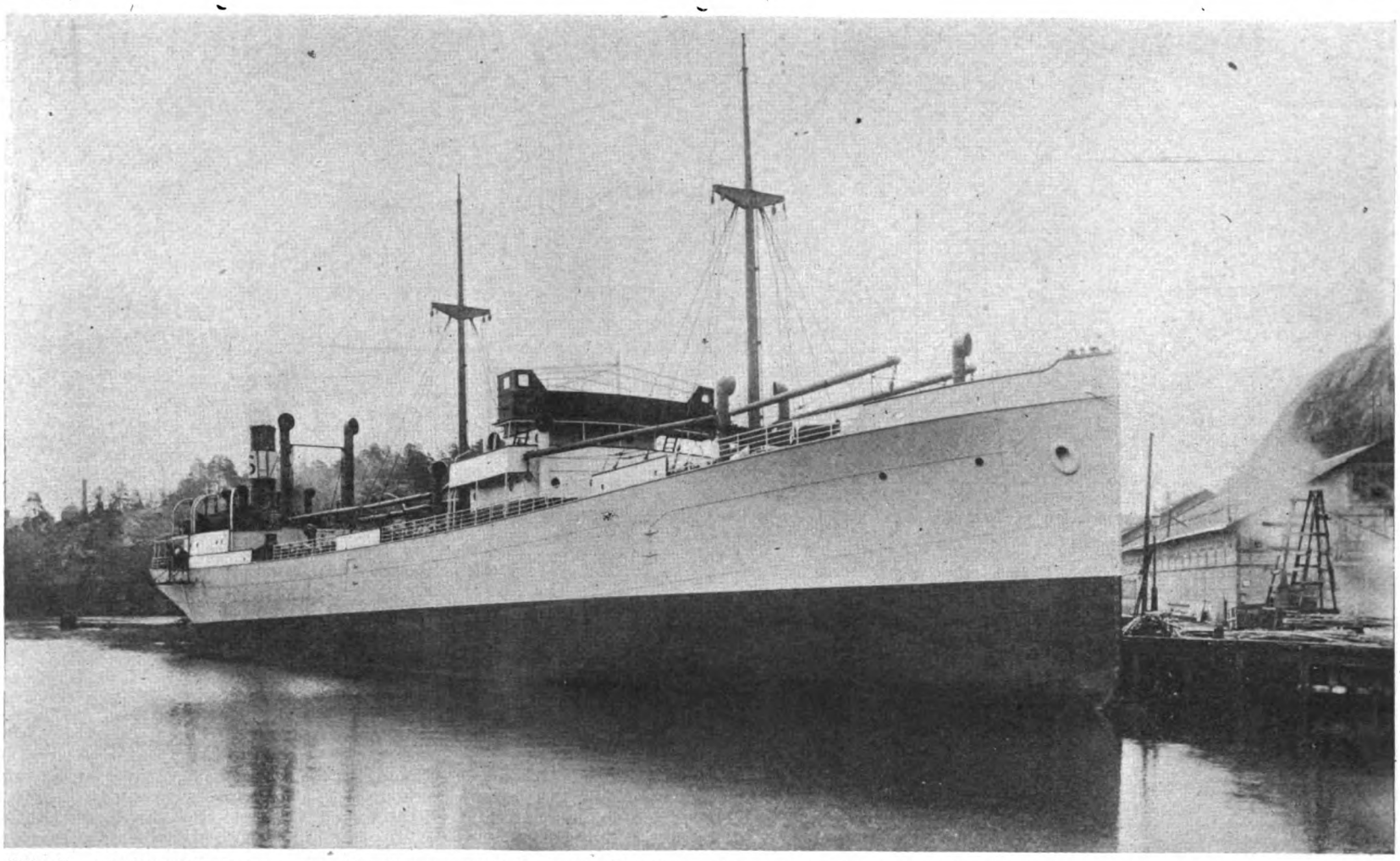
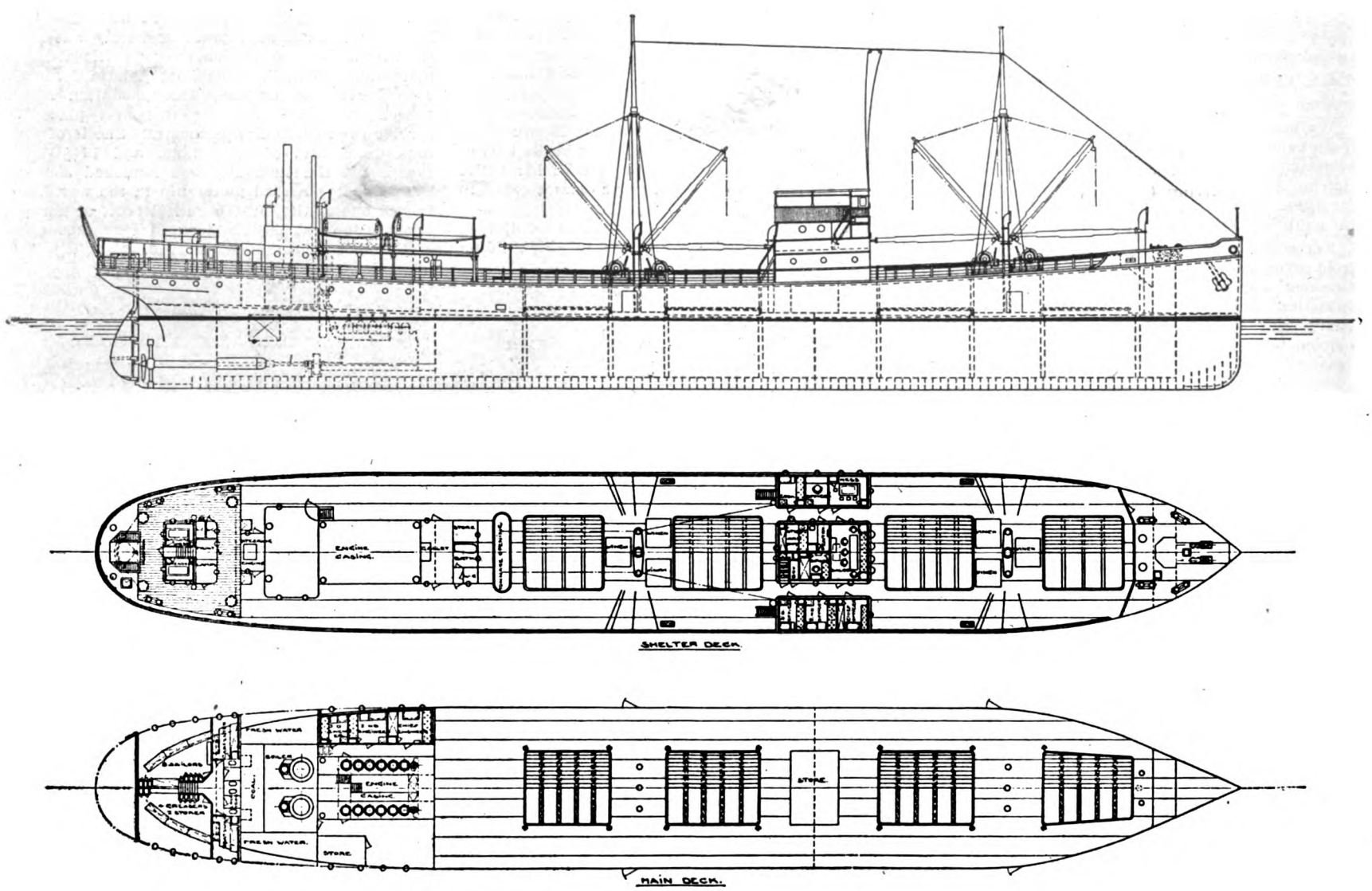


"Finn", a twin-screw cargo motorship just completed at the Finnboda shipyard, Stockholm, Sweden, and propelled by twin 500 h.p. Polar two-cycle Diesel-engines.



Plans of the motor-freighter "Finn." She has recently been placed in service.

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From Portland, Maine, to Rimuski, Quebec, by Motor Tug

Maiden Cruise of the Oil-Engined Boat "Lewis L"

By A MEMBER OF THE CREW

THERE are not very many heavy-oil engined tugs in service in this country, so the performance of a boat of this class on her maiden voyage may be of considerable interest. The "Lewis L" now owned by the Brown Company, conducting a lumber and pulp business in the northeastern part of the United States and Canada, is a wooden boat built in Friendship, Maine, equipped with twin-screw 30 h.p. Mianus-Leisner Diesel type oil-engines.

These engines were installed in the "Lewis L" at Portland, Maine, in September, 1920. On September 24th they were started, compass adjusted, and later the officials of the Brown Company, including their President, Mr. Brown, were taken on a trial trip. Mr. Brown, after discovering how little fuel the engines used, said, "Put them in our tow boats."

As soon as the necessary ship's papers were obtained the first lap of our cruise was started on September 29th in the afternoon, when we put out for Boothbay Harbor, Captain Rowell, "Admiral" of the Brown Company's fleet, in charge.

That evening heavy fog was encountered, and the lighthouse near Boothbay Harbor could be heard but not seen, the fog was so dense. We came near running it down, but by good fortune didn't. We anchored and waited for daylight. After we anchored, Captain Rowell asked how much fuel had been used. The measurements and gauge on tank showed that we had used 1.6 gallons per hour per engine.

The next morning, September 30th, leaving the lighthouse at Boothbay Harbor for Rockland, Maine, the storm signals were flying, denoting southeast storm. Weather reports predicted a gale. Before we got to Rockland there was a heavy sea running. Regardless of the sea, the engines kept working steadily, and ran us into Rockland two hours before the gale broke. The next afternoon, October 1st, after the gale had subsided, we started for Jonesport. We had heavy weather all the way, but otherwise the trip to Jonesport was uneventful.

Leaving Jonesport on the morning of October 3rd, we had fine weather and a fair tide making Eastport, Maine, the same day, after a fine run. We lay in Eastport until October 8th, waiting for telegram release of the boat's papers from the U. S. Shipping Board.

During our stay in Eastport, Captain Rowell's numerous duties elsewhere made it necessary for him to return, leaving Captain Smith in charge. We left Eastport October 8th for Yarmouth, Nova Scotia. Crossing the Bay of Fundy, where the rise and fall of the tide is so great that with the contrary winds the sea is usually very boisterous, we were fortunate enough to have a sea that was almost like a mill pond, and arrived at Yarmouth without incident, the evening of the same day. The next morning, October 9th, we left Yarmouth, starting for Liverpool, Nova Scotia. A few hours after sailing we noticed heavy fog banks coming, and we were compelled to make port.

We were up early and left before daylight, and sailed by the compass, as a heavy fog enveloped us. We had to rely on the compass altogether that day. We set our course by chart from one gas buoy to another, which were many miles apart, but luck favored us for about time to locate our buoys, the sun broke through the fog long enough to sight them, shape our course and run by compass to the next buoy. When the sun did break through the fog there were "fog-bows," which resemble rainbows, but are much more brilliant than any rainbow ever seen on land.

We had now completed eleven days of our cruise, and the Mianus twin-screw 30 h.p. engines had certainly given a good account of themselves, and caused us no anxious moments on account of faulty operation; on the contrary, they kept steadily on the job.

Leaving Liverpool, our next port was Halifax, Nova Scotia, where we arrived without incident the evening of October 11th. This was the day of the big race of the Canadian fishing smacks. These, of course, were sailing-vessels used for fishing purposes only, and only Canadian fishermen were participants in the race.

At Halifax, we opened the vessel's hold, got our supply of cylinder and fuel-oil and filled the supply tanks to the engine. We had now covered about 600 miles, or a little less than half the trip. By measurements we found the engine as economical as ever in fuel-consumption.

From Halifax we went to Drum Head, where we arrived at about 9 o'clock in the evening of October 12th. Due to bad weather, we stayed in Drum Head until the morning of the 14th, and our course then lead to Cape Canso. Our barometer gave us fair warning of what we might expect, registering as low as 26.3. About ten miles from the Cape the gale hit us, blowing 50 to 60 miles an hour, and we "land-sailors" on board certainly wished we were on shore. We must say, however, that the engines couldn't have behaved better, never missing an impulse; and despite the rough weather and heavy wind we encountered, as the wind was blowing off shore, had they failed, the chances would have been slim for anyone of us seeing shore again.

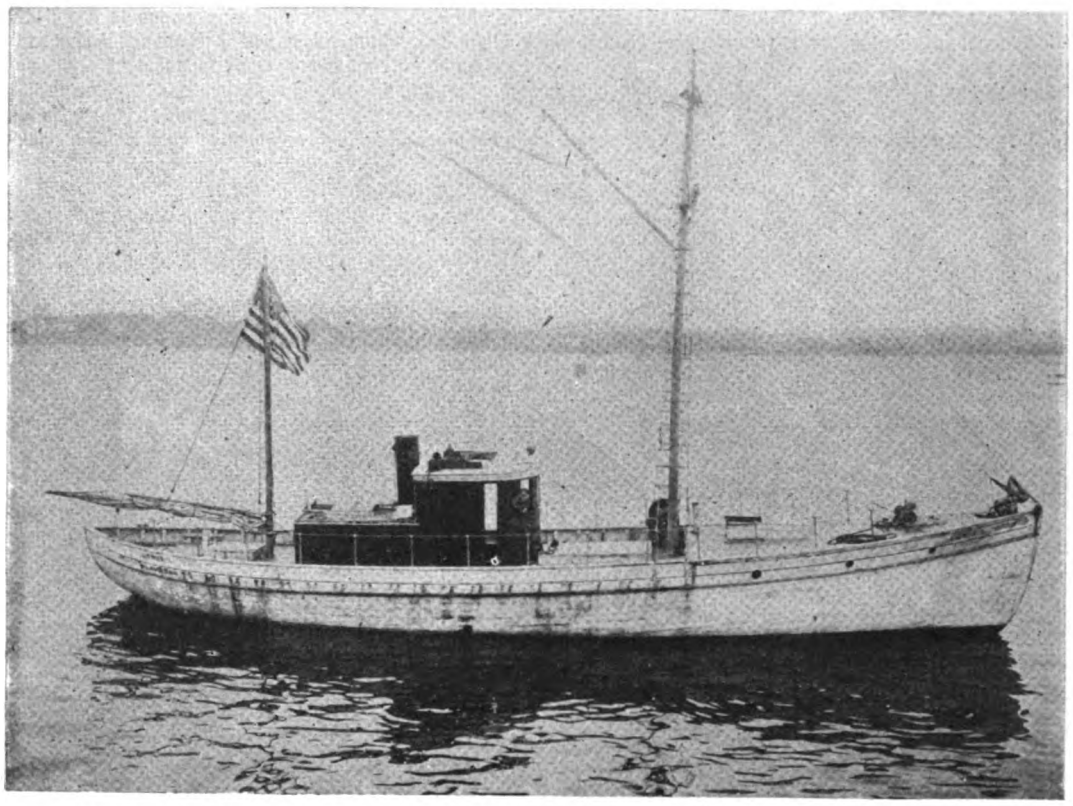
The barometer was still low, but we left Cape Canso for Hawkesbury on Cape Breton Island, the morning of October 15th. Because of bad weather from Cape Canso to Hawkesbury, a distance of about 25 miles, we decided to go no further than Hawkesbury until we got more favorable weather. The wind blew very strong that morning, and it took us about 8 hours to make that short run. Engines working hard all the time in a headwind and heavy sea. The bad weather didn't let up for several days, but by October 19th we started again. It seemed as though the wind blew harder days than nights, so we left Hawkesbury October 19th at 3 o'clock in the morning with fresh wind blowing, and had good going that morning for several hours. Later the wind freshened up, and the sea got very rough. At one time we were apparently standing still with the engines running full-speed ahead, the wind had increased to such an extent and was blowing so hard. The wind was so strong that at times the boat was awash from stem to stern. The pilot we had taken on board at Halifax came back to the engine-room, and wanted to know how things were. He was told that everything was running fine. Notwithstanding this fact, he said if the weather didn't improve, he thought it best to go back to Hawkesbury and wait for more favorable weather. However, because of the performance of the engines, we were able to hold our own for an hour, when the tide turned and ran with the wind, making somewhat smoother water, thus allowing us to proceed to Pictou, which port we finally made at 3 P. M. October 19th.

We started from Pictou the next morning at 3 o'clock. Fog hemmed us in, and we were compelled to anchor. By the time the sun was up the fog had raised, and we headed our course for Summerside, P. E. I. We had rough weather crossing the Bay, but as soon as we were under the lea of P. E. I. we had fine sailing all the way, arriving at Summerside 7 P. M., October 20th, where we lay three days on account of stormy weather.

At 7 P. M., October 23rd, we left Summerside for Gaspee. The engines were not shut down again until 6 P. M., October 24th, making a run of 23 hours. We started from Gaspee at 3 A. M., October 25th, running the motors until 9 P. M. We anchored for three hours to get a little rest, and then started for Rimuski, Quebec, up the St. Lawrence River, and arrived at Rimuski 6 P. M., October 26th. That ended the cruise so far as the boat was to go north.

October 27th, at noontime, there was a telegram from the Brown Company to Captain Dale, telling him that there was a pilot at Rimuski, who would show us across to the Brown Company's lumber camp on the opposite side of the St. Lawrence, and that we were to take over a load of supplies and provisions. The provisions and supplies were put on board, including about a thousand blankets, which were thrown on deck. The wind was with us when we started, but before we reached the other shore we encountered heavy sea, and the blankets were hurled down into the galley, all but smothering the cook. Our pilot, Chappie, the one we had taken on board at Rimuski was seasick, and completely lost his bearings, heading us for the shoal on the other side of the river. Our Halifax pilot and Captain Smith saved the day by running the wheel over and heading for deep water. A few hours later we made port in the lea of a point, remaining at anchor until 3 o'clock the next morning. At that time we left the point and made the entrance to the harbor, where a small launch met us to pilot the "Lewis L" into the Brown Company's dock.

We made the dock and discharged our cargo. The next high tide was about 4 o'clock, and in came a schooner loaded with cattle and pigs in the hold and horses on deck. The sails were furled, and they had started engine to make the dock. The man at the wheel gave orders to stop the engine, but for some reason the engineer didn't



The Mianus oil-engined tug "Lewis L."

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obey orders, consequently the boat came up to the dock, passed it and ran on top of a ledge of rocks. As the tide fell, the boat listed, and there was certainly some commotion. The animals in the hold set up such a noise it was almost deafening, especially the pigs. The horses on deck were working as hard as they would on a steep hill to keep on the boat, and there was plenty of excitement for a while. Our crew hurried to the rescue, and assisted in slinging the horses off the vessel.

The next morning at 3 o'clock we got a message that the Brown Company's tow-boat was at the mouth of the harbor with a load of passengers. Due to weather which was too heavy for the tow boat, it was late in coming in. The tide doesn't rise high enough to allow this tow boat to come in over the bar, so we had orders to go out with our boat and get the passengers that had been storm-stayed for several days. The sea was not rough, and we tied alongside the tow boat, taking off her passengers and brought them safely to shore.

The tide now began to drop, and one of the Brown Company officials at the camp came aboard and gave orders to go to the other shore at once. The tide had already dropped to such an extent that the boat, in going over the bar, struck it, but cleared, and the boat's course was headed for Rimuski. The wind freshened, and the sea increased until it was almost too much for a boat to live in. Nearly everyone on board was seasick, and especially the Brown Company's official who gave the order to proceed to the other shore. We thought we had had heavy weather before, but never any weather as severe as this. At one time the bow of the boat was hit by the sea which caused it to drop faster than gravity. The stove left the stove lids in the air, and the boat being struck by another wave sidewise, when the lids dropped instead of dropping on the stove, they dropped on the cabin floor. Such a test as this is seldom given to any marine motor, yet the Mianus oil-engines came through without missing an impulse. During the whole run of about 1,400 miles, they were never held up for engine trouble. Several times on this cruise the seas were running so heavy the propellers were lifted out of the water, but, due to the governor on the engine, the engine didn't race, only increasing its revolutions about 15 per minute.

Standard Oil Motor Barge "Rochester Socony"

Interesting Steel Vessel Propelled by Standard Gasoline Engines

A NUMBER of interesting motor tank-barges are on order with the Moore Plant of the Bethlehem Shipbuilding Corporation at Elizabeth, N. J., and the first of these vessels has recently been placed in service. Such excellent results have been given with gasoline engines built by the Standard Motor Construction Co. of Jersey City, N. J., in craft of this size and smaller which they own, that the Standard Oil Company of New York decided to equip these barges with the same type of power plant.

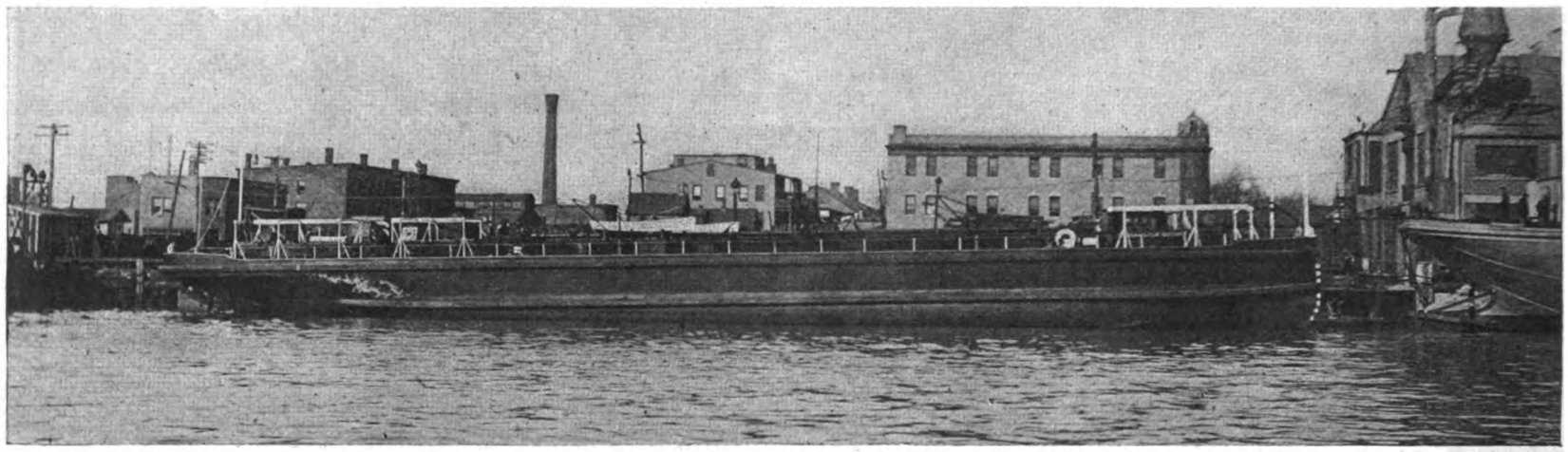
Very interesting vessels have resulted. The hulls are constructed on the Isherwood system in way of eight oil-tanks with transverse framing fore and aft. The leading dimensions are as follows:

Net-cargo-capacity	788 tons
Fuel-oil (gasoline capacity)	4,000 gals.
Length	148.7 ft.
Breadth	28.1 ft.
Depth	11.8 ft.
Gross tonnage	400 tons
Net tonnage	287 tons

The machinery is installed aft, and the main engine is a 6-cylinder, 4-cycle type Standard gasoline engine, 12-inch bore by 14-inch stroke, developing 300 shaft h.p. In addition there is a 24 b.h.p. 4-cylinder Standard gasoline engine direct to a 100 K.W. direct-current generator of 100 volts made by the Electro Dynamic Co. of Bayonne, N. J.

For operating the cargo holds there is one Gould's No. 6 Rotary pump and one auxiliary cargo pump 8x10-inch duplex connected to 50 h.p. 4-cylinder Standard gasoline engine. Furthermore, the engines and pumps can be operated from the deck by means of extension stems and levers. The 100 K.W. electric-generator just referred to furnishes current for an electric steering-gear built by the Moore Plant and fitted with Cutler-Hammer control gear. The gear itself is arranged either to operate by means of electricity or by hand power. The capstan windlass is of vertical type hand-operated.

Quarters for the crew are arranged in the forward part of the vessel just aft of the fore-peak tank. The crew consists of Captain, mate, 2 engineers and 8 seamen. Galley and messroom combined, also toilet with shower baths, are located aft of engine-room.

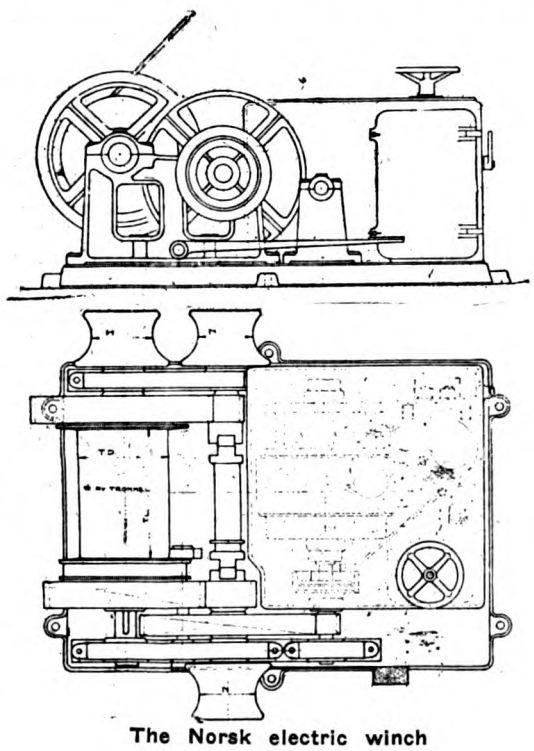


"Buffalo Socony," the first of a fleet of Standard-engined barges for the S. O. Co. of N. Y., built at the Moore plant of the Bethlehem S. B. Co.

NORWEGIAN MOTORSHIP'S ELECTRIC WINCH

Of late a number of descriptive articles have appeared in "Motorship" dealing with different domestic makes and types of electric-winches for merchant-ships, and it is interesting to note that very rapid progress is being made with this class of machinery, as is usual with anything electrical in this country. At the same time it is well not to lose track of what European winch manufacturers are doing, as in most cases their experiences extend over a longer period, particularly in the case of motorships, where the available power for the winches is not very flexible, but which is limited to the power of the auxiliary Diesel engines installed when the ship is built. This power depends upon the amount the owner is willing to invest when planning the ship.

In the past European shipowners do not have appeared to consider that very rapid-operating winches secure sufficient gain to offset the extra cost of the auxiliary plant in general. But with the average American ship-owner, quickly operating deck-gear is of the greatest importance, and that swift handling of cargo and short stays in port affect economies of values. Thus American electric-winches have a lifting speed of 150 to 200 ft. per minute with an average load. This saves quite a little time, both loading and unloading. Most European motorships that have visited this country have electric-winches operating in the neighborhood of 100 ft. per minute. Nevertheless, from a constructional aspect they have many noteworthy features.



The Norsk electric winch

One of the best known electric-winch makers in Scandinavia is the Norsk Elektrisk & Brown Bros. of Kristiania, Norway, whose motorship winch we illustrate. The electrical parts are well-protected from the elements, being placed in a cast-iron case that is fitted with watertight doors and cover, while the housing containing the resistance has a good ventilating arrangement. There are three models as follows:

Direct pull on Drum	Power	Lifting Speed ft. per min.
1½ tons	13	108
3 tons	13	50
5 tons	22	50

The three and five ton models are so fitted that they can run at 132 ft. per minute with 1,000 and 1,800 kg. load. Each which have three capstan-drums and band-brake operated by a foot pedal, and all bearings are metal bushed and the gears have cut teeth.

MOTORSHIP "THEODORE ROOSEVELT" CHARTERED AT LOW RATE

The new Danish motorship "Theodore Roosevelt," 4,500 tons gross and 11 knots loaded speed, has been chartered to load wheat at Portland, Ore., for Great Britain at the rate of 87 shillings 6 pence, or about $14.75 at current exchange rates. This rate is $3.25 under the rate recently set by the U. S. Shipping Board. The "Theodore Roosevelt" has a carrying-capacity of 567,000 cubic ft. of wheat, also 12 passengers, on a loaded displacement of 15,065 tons.

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